BOARD OF EDUCATION.

REGULATIONS

FOR

TECHNICAL SCHOOLS, SCHOOLS OF ART, AND OTHER FORMS OF PROVISION OF FURTHER EDUCATION

IN

ENGLAND AND WALES.

(In force from 1st AUGUST 1913.)

Presented to both Houses of Parliament by Command of His Majesty.

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CONTENTS.

Chapter 3.

Conditions of Grant specially applicable to "Technical Institution Courses" and "Day Technical Classes."

Chapter 4.

Conditions of Grant specially applicable to "Schools of Art" and "Art Classes."

Chapter 5.

Endorsement of Certificates and Diplomas.

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PREFATORY NOTE.

Introductory.

1. The present volume includes the Regulations governing the payment of Grants to the various types of schools and classes formerly aided by the Board under the general description of "Technical Schools, Schools of Art, and other forms of further education," with the exception of four types of work now treated under separate Regulations. These four are :—

(*a*) Certain portions of the work of Universities which have been aided since 1911 by the Board under the Statement of Grants available from the Board of Education in aid of Technological and Professional work in Universities in England and Wales (Cd. 6794);

(*b*) Junior Technical Schools, which have been aided hitherto under Article 42 of the Regulations for Technical Schools, and will be aided henceforth under separate Regulations (Cd. 6919);

(*c*) Schools of Nautical Training which have been aided hitherto under Article 42 of the Regulations for Technical Schools, and will be aided henceforth under separate Regulations (Cd. 6868);

(*d*) University Tutorial Classes which have been aided hitherto under Article 32 of the Regulations for Technical Schools, and will be aided henceforth under separate Regulations (Cd. 6866).

In future the Regulations for some or all of the three last mentioned types of schools or classes (viz., Junior Technical Schools, Schools of Nautical Training and University Tutorial Classes) will probably be included in a single volume with those for the types of work dealt with in this volume, but it has been found convenient this year to issue them separately. The present volume also contains Regulations for the endorsement by the Board of Certificates and Diplomas granted by Technical Schools : these conditions were originally set forth in the Board's Circular 776, issued in June, 1911.

2. Separate bodies of Regulations are issued for—

(i) Examinations in Science and Technology;
(ii) Examinations in Art;
(iii) The National Competition;
(iv) Scholarships and Exhibitions in Science;
(v) Sir Joseph Whitworth's Scholarships and Exhibitions;
(vi) Scholarships and Exhibitions in Art;
(vii) Certificates for Teachers of Art.

It is intended as soon as possible to include these sets of Regulations in a single volume of Supplementary Regulations.

Notes upon the Changes introduced by these Regulations.

3. The more important of the changes which have been made in the Regulations in force for 1912–13 and the reasons for those changes are briefly noted below:—

(i) *Article* 4 (*c*).—The arrangement provisionally adopted last year for defining the types of rural educational work to be supervised and aided by the Board of Agriculture and Fisheries was found in practice to involve the inconvenience of a dual supervision of certain classes, which were taking courses of instruction including both general subjects and rural subjects of a technical agricultural character. To avoid that inconvenience the modified arrangement set out in Article 4 (*c*) of the present Regulations has been adopted. Under this arrangement the Board of Agriculture and Fisheries will concentrate its attention upon those courses which are planned for students over 16 or 17 (other than teachers), and consist principally of instruction in technical agricultural subjects.

(ii) *Article* 21 (*b*).—The Board have hitherto found it necessary to attach special conditions to their recognition of courses of instruction of the "University Extension" type, and these conditions could not be satisfied in courses of less than 28 hours' duration. The Board are now prepared to recognise for grant University Extension Courses of 20 hours' duration or more, on condition that the lecture given at a meeting and the class exercises which follow it are treated as forming a single period of instruction. It will therefore not be

possible to register the attendances of those students who are present for the lecture only or for the class exercises only.

(iii) *Article* 21 (*d*).—In the areas of many Authorities the organisation of the Evening and Technical Schools has been based upon the classification of courses indicated in Circular 776. This classification emphasises at each stage the importance of working through a course of instruction planned to be taken as a whole and extending over more than one year. The Board consider that the adoption of this classification in areas where it is not yet in force will contribute towards the increased efficiency of Evening and Technical School work, and they therefore propose to ask that in all cases where recognition of Grouped Courses is desired the relation of each course to the classification set out in Article 21 (*d*) shall be indicated.

(iv) *Article* 29 (*a*).—This article remains substantially as it appeared in the Regulations for 1912–13, but it has been slightly amended in order to emphasise the importance of adhering to the arrangements of the courses as planned. The examination of grant claims has made it evident that in not a few cases students have been treated as following a Grouped Course, although they had made no attendance at important subjects of the Course. In cases where there is undue laxity in carrying out the course arrangements it may be necessary for the Board to withhold the advantages of Grouped Course treatment.

(v) *Article* 29 (*b*).—This article also remains substantially as in 1912–13, with the exception that provision is made for the relaxation of the normal requirements of 4 hours a week and 80 hours in all in certain exceptional cases where such relaxation appears to be educationally justifiable.

(vi) *Article* 32 (*d*).—University Tutorial Classes in Literature, General History, Economic History, and other non-vocational subjects have in the past been aided under Article 32 (*d*) (iii) of the Regulations. Provision is now made for aiding such classes under special Regulations, and opportunity has been taken to revise and simplify the wording of Article 32 (*d*) in its application to Commercial Courses and to Courses,

other than University Tutorial Courses, in literary subjects.

(vii) *Article* 38 (*c*) *to* (*f*).—In order to secure that grants for Technical Institution Courses shall not operate in a manner prejudicial to the proper economy of educational effort, the Board for some years past have found it necessary to scrutinise carefully all proposals for recognition under Articles 35–41 of Courses taken in preparation for Matriculation Examinations or for Intermediate or Final Examinations for a University Degree. The preparation of students of school age for Matriculation is not merely work proper to Secondary Schools, but cannot be withdrawn from the Secondary Schools of an area without seriously limiting the usefulness and impairing the efficiency of those Schools. Accordingly, the Board are only prepared to recognise Technical Institution Courses planned to prepare students for Matriculation if they are for students of 18 years of age or over. It is also part of the work proper to the Upper Forms of a Secondary School to provide, for pupils who are qualified for Matriculation, courses of study of a scope and standard corresponding to those taken by students preparing for Intermediate Examinations for a University Degree. Wherever the Secondary Schools are in a position to undertake such work it is not desirable that courses of the same type should be provided in Technical Schools for students of school age. The Board recognise, however, that for the present some Secondary Schools do not find it possible to provide instruction carrying pupils beyond the Matriculation standard, and they are therefore prepared to recognise under Articles 35–41 courses in preparation for Intermediate Examinations in Science, provided that they are confined to students who have qualified for Matriculation and, if the course leads to the Examinations for a Degree in Science other than Engineering, are over 17. As the present requirements for the Intermediate Examination for a Degree in Engineering are such that few Secondary Schools can provide suitable instruction, Courses in preparation for that Examination may be recognised under Articles 35–41 provided that they are confined to students qualified for Matriculation. The Board may, as regards individual students whose circumstances may be shown to be entirely exceptional, relax

the age limits of 18 and 17 respectively mentioned above, but they will not, as a rule, entertain any such application in the case of a pupil leaving a Secondary School to enter a Technical Institution Course, unless the application has been submitted before the pupil leaves the Secondary School.

(viii) *Article* 42 (*c*).—It is anticipated that certain of the Schools now recognised under Article 42 may not be able to comply at once with the full requirements of the separately issued Regulations for Junior Technical Schools or those for Schools of Nautical Training, although they are of the types for which provision is made in those bodies of Regulations. Temporary provision is therefore made for the continued recognition of such Schools under Article 42. The period of two years during which Managers are allowed the option of remaining under the old Regulations will, it is expected, be sufficient for any reorganisation that may be necessary in such cases.

(ix) *Article* 51 (*c*).—The Board have decided to bring under the provisions for a fixed annual grant the few Schools of Art for which grant is still assessed under Article 32 (*e*).

They have also made provision for treating suitable instruction in other than artistic subjects as part of the work covered by a fixed annual grant, and thereby to facilitate the organisation of Trade Schools and Continuation Classes for younger students as a preparation for, and in definite relation to, the work of a School of Art proper.

(x) *Article* 52.—The reorganisation of the Art Examinations has made it necessary to revise the conditions under which candidates can be accepted as Art Pupil Teachers, pending any more extensive changes in the various Regulations for the provision of State aid towards the maintenance of art students which may before long become desirable.

The passing of the new Drawing Examination will naturally be accepted as satisfactory evidence of attainments in Art subjects, and the Board will also accept such successes gained under the former system of Examinations as would have been accepted as a qualification for Art Pupil Teachership in recent years. But they recognise that there may also be suitable candidates,

who are not yet sufficiently advanced to attempt the new Drawing Examination, and had not obtained the former qualifications when the old system of Art Examinations come to an end. For the present, therefore, they are prepared to consider a report from the Head Master of the School of Art attended by the candidate upon his or her Art attainments, together with such evidence as can be furnished by the production of worked exercises.

(xi) *Article* 53.—The small special grants formerly made to Schools of Art in respect of the successes of students instructed at the Schools in the Competitions for Scholarships, &c. in Art will be discontinued.

(xii) *Articles* 55–65.—These Articles incorporate with some slight modifications the provisions announced in that part of Circular 776 which dealt with the endorsement of Grouped Course Certificates and Diplomas. Opportunity has been taken to define the Board's views on certain points, *e.g.*, as to the functions to be assigned to the Assessors who take part with the teachers in the Examinations held in the final years of Diploma and Certificate Courses. Provision is made also for continuing for a limited period the endorsement of Certificates issued under schemes approved under the former Regulations.

Relation of these Regulations to the last complete body of Regulations for Technical Schools, &c., which were issued in 1909.

4. It was explained in the third paragraph of the Prefatory Memorandum to the Regulations for Technical Schools, &c., in force from 1st August 1910 that the Regulations in that volume were limited to those determining the conditions of grant, and that Parts II. to IV. of the 1909–10 Regulations would continue in force until further notice was given. Parts II. and III. of the 1909–10 Regulations dealt with Examinations in Science and Art, with the National Competition, and with Scholarships and other forms of Aid to Students. The following paragraphs indicate the bodies of new Regulations which have replaced Parts II. and III. of the 1909–10 Regulations.

5. The former systems of Examinations in subjects of Science and Art were dealt with in Articles 55 to 69

of Chapter 5 of the 1909 Regulations, in the Appendix to that Chapter, and in Articles 73 (*a*), 74, and 75 (part), which were included in Chapter 6. These provisions have been replaced as regards Science by the Regulations prefixed to the Volume of Syllabuses for the Examinations in Science and Technology and by the Rules for the Local Management of those Examinations (Rules 104), and as regards Art by the Regulations for Examinations in Art (Rules 110).

6. The National Competition was dealt with in Article 70 and Article 72 of Chapter 5 of the 1909 Regulations, in part of Article 75 in Chapter 6, and in Form 564 T., which contained the detailed conditions of the Competition. These various provisions have been replaced by the Regulations for the National Competition (Rules 108).

7. Teaching Certificates in Art are now dealt with in a separate body of Regulations (Rules 109) which provide for the issue of the new Certificates for Teachers of Art under the provisions of Circular 786, and also for the temporary issue of Certificates under the old Scheme. These Rules replace Article 71 of Chapter 5 of the 1909 Regulations and the former syllabus of qualifications for the Art Class Teacher's and Art Master's Certificates.

8. The provisions of Chapter 7, Chapter 9, and of the Appendix to Part III. of the 1909 Regulations have been replaced, so far as regards Scholarships and other Awards in Science, by the Regulations for Scholarships, Exhibitions, &c., in Science 1914, with which is to be read the Prospectus of Sir Joseph Whitworth's Scholarships and Exhibitions. The provisions of the same portions of the 1909 Regulations as regards Art, and of Chapter 8 of those Regulations which had reference to Art only, have been replaced by the Interim Regulations for Awards in Art.

9. Article 73 in Chapter 6 of the 1909 Regulations has been replaced by Chapter 5 of the present Regulations, which gives effect to the announcements made in Circular 776 as to the endorsement of Grouped Course Certificates and Diplomas, and in the same Chapter of the present Regulations provision is continued for the endorsement of the Full Technological Certificates of the City and Guilds of London Institute.

10. Part IV. of the Regulations for 1909 which provided certain forms of aid for Museums, Educational Exhibitions, and Schools will in future be replaced by a separate body of Rules.

11. As a result of the rearrangements described above, the Regulations issued in 1909, as well as the Grant Regulations for 1910 and the Modifying Regulations for 1912 will cease to be operative upon 31st July 1913, except as regards the payment of grant for courses belonging to the year 1912–13.

L. A. Selby-Bigge

7 *July* 1913.

BOARD OF EDUCATION.

Regulations for Technical Schools, Schools of Art, and other Forms of provision of Further Education in England and Wales.*

N.B.—*Articles or parts of Articles which are either new or substantially modified are printed in italic type.*

PRELIMINARY.

1.—(*a*) No grant is made under these Regulations in respect of any Public Elementary Schools, Pupil-Teacher Centres or Preparatory Classes, Training Colleges for Teachers in Elementary Schools or in Secondary Schools, or Training Schools for Teachers of Domestic Subjects, *or in respect of any work falling within the purview of the Exchequer grant to University Colleges or the Board's grants in aid of technological and professional work in Universities,* or, in the case of a Secondary School, in respect of any part of it for which grant is payable under the Regulations for Secondary Schools, *or in respect of any School in receipt of grants under the Regulations for Schools of Nautical Training.*

(*b*) In no case is a grant payable in respect of instruction in Religious Subjects.

(*c*) The conditions required to be fulfilled in order to enable any grant to be made by the Board of Education (hereinafter called "the Board") in respect of any School, Class, or Institution, other than those referred to in (*a*) above, are those contained in the following Regulations, which take effect from 1st August 1913.

(*d*) The School, Class, or Institution in respect of which a grant is made is hereinafter called "the School."

(*e*) If any of the conditions of award of grant are not fulfilled, the Board may withhold the grant, or if they think fit, pay it with or without deductions, and may warn the Managers that a grant will not again be paid in similar circumstances.

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* These Regulations may be quoted as "The Regulations for Technical Schools, &c."

1.—(*cont.*)

(*f*) The decision of the Board as to whether the conditions have been fulfilled in any case, or as to the application or interpretation of these Regulations, is conclusive.

(*g*) A copy of the Regulations must be kept on the School premises.

(*h*) *The Regulations for Junior Technical Schools, and the Regulations for University Tutorial Classes, though issued in a separate form for the present, are to be regarded for the purposes of this Article as forming part of these Regulations.*

CHAPTER 1.

General Conditions.

2.—(*a*) The School must be superintended by a suitably constituted body of Managers, to whom, subject to the conditions hereinafter provided, the grant will be paid; and a person must be appointed to act as correspondent on behalf of the Managers. Where in the opinion of the Board it is necessary, the body of Managers must include women. A list of Managers available for reference must be kept on the School premises.

(*b*) The body of Managers must include at least one person able to visit the School frequently. Where a Local Education Authority are the Managing Body, exemption from this condition may be given if the Board are satisfied with the arrangements made for securing due supervision and local interest.

(*c*) In the case of any School working under the direction of the Council of any County or County Borough, the grant will be paid to the Council, and the correspondent will be appointed by the Council.

3. A person attending as a day or evening student shall not be required, as a condition of being admitted into or remaining in the School, to attend or abstain from attending any Sunday School, place of religious worship, religious observance, or instruction in religious subjects in the School or elsewhere; and the times for religious worship or for any lesson on a religious subject shall be conveniently arranged for the purpose of allowing the withdrawal of any such scholar therefrom.

4.—(*a*) Grant will not be payable in respect of the attendances of a student (1) who is under 12 years of age, or (2) who is still in attendance at any School or course

4.—(*cont.*)
of instruction where his attendance is recorded for the purpose of a grant under any other Regulations of the Board, *or* (3) *who is in attendance at a Certified Industrial School.*

(*b*) Pupil-Teachers may not attend Schools recognised under these Regulations unless with the written consent of the Head Master or Mistress of the Pupil-Teacher Centre attended by them, or unless attendance at such Schools forms part of the arrangements for their instruction approved under Article 28 of the Board's Regulations for the Preliminary Education of Elementary School Teachers; in no case may the attendances of Pupil-Teachers be counted for grants.

(*c*) *Grant will not be payable under these Regulations in respect of Courses intended for students over* 16 *or* 17 *in which the instruction given is chiefly in Technical Agricultural Subjects, or in respect of Courses given as part of his staff work by a teacher recognised by the Board of Agriculture and Fisheries as a member of a County Agricultural Staff or of the staff of an Agricultural College; except that all Courses for the training of Teachers in Schools and Classes aided by the Board of Education will be eligible for aid under these Regulations, even though the subject of instruction be agricultural or the teacher be a member of a County Agricultural Staff or the staff of an Agricultural College.*

(*d*) *For the purpose of these Regulations Gardening will be regarded as a Technical Agricultural Subject if taken in a Course planned for students over* 16 *or* 17.

5. The term "year" in these Regulations means the twelve months ending the 31st July.

6. The School will not, as a rule, be placed or continued upon the list of recognised Schools except upon an application made in each year to the Board on the Form, and by the date, prescribed in Chapters 2, 3, or 4.

7.—(*a*) The School must be open at all reasonable times to inspection by the Board.

(*b*) A deduction from the grant not exceeding 1*l.* may be made if the Inspector finds any class closed at a time when the time-table provides for instruction being given.

(*c*) At least a week's notice of any alteration in the teaching staff, or in the time-table, affecting the place,

7.—(*cont.*)
days, or hours of meeting, or of a holiday, or of the date of the closure of a class, whether for the session or merely for a time, must be given to the Inspector named to the School for this purpose. Unless it is possible to give at least seven days' clear notice of an intended closure, such notice should be given by telegram addressed by name to the Inspector at "Instruction,* *Parl.*, London" (the telegraphic address of the Technological Branch of the Board of Education).

8.—(*a*) The School must not unduly compete with any other School.

(*b*) Before recognising as eligible for a grant under these Regulations any School not working under the direction of a Local Education Authority, the Board will, as a rule, invite the opinion of the County or County Borough Council on the question of the necessity of such School, and will have regard to the co-ordination of all forms of education in the area of the Council.

9. The School must be suitable in character and financial position to receive aid from the Board and must not be conducted for private profit, or farmed out to the teacher.

The extent to which and the conditions under which Residential Institutions can be regarded as eligible for grants under these Regulations are now under consideration; and for the present the Board are not, as a rule, prepared to regard as eligible for grant any such institutions which are not already in receipt of grant.

10. No student may be refused admission on other than reasonable grounds.

11.—(*a*) The scale of fees must be suitable to the circumstances of the locality, and must have been approved by the Board either for the individual School or for a group of Schools of which it forms a part.

(*b*) If it is desired to charge no fees in any School or group of Schools, the proposals submitted for the Board's approval must show why this is thought desirable.

(*c*) If it is desired to waive fees in the case of individual students, or to return fees to individual students at the end of the session, the proposals submitted for the Board's approval must show the conditions

* *As regards Wales (including Monmouthshire) the telegraphic address "Principality, Parl., London" should be used.*

11.—(*cont.*)
under which and the methods by which such waiving or returning of fees will be carried out.

12. The School must have adequate local support. At least 25 per cent. of the expenditure of the School, or group of Schools under the same Managers, or under the direction of the same County or County Borough Council, should be met from sources other than the Board's grant, such as fees, subscriptions, endowments, or the funds of Local Authorities.

13. The grant must be expended to the satisfaction of the Board.

14.—(*a*) The attendances of all students admitted to the School must, except as provided by Article 39 (*b*), be recorded in the Registers supplied by the Board, and in accordance with the Rules furnished therewith.

(*b*) *Records must also be kept in an admission register or some other form, and must be in accordance with any Rules that may be prescribed by the Board.*

(*c*) If required by the Board, through their Inspector or otherwise, the Registers and other School documents, or any of them, must be submitted for inspection forthwith.

15. All returns, statistical and financial, called for by the Board from any body of Managers or Local Authority must be duly made.

16. The School must be efficient, and the progress of the students must be satisfactory.

17.—(*a*) The premises must be sanitary, convenient for teaching purposes, adapted to the circumstances of the School, and provided with such equipment and appliances as are necessary for the approved course or courses of instruction.

(*b*) The plans of the site and buildings of any new School specially provided for the purpose of instruction under these regulations, or of any enlargements or alterations of existing Schools made for the same purpose, must be submitted for the Board's approval. *The details of any proposals for installation of equipment must, if required, be similarly submitted.*

18.—(*a*) The Teaching Staff must be adequate and efficient.

(*b*) Provision must be made for the supervision of the teaching staff as regards organisation, registration,

18.—(*cont.*)
the advice given to Students, and the co-ordination of the subjects taught. Where, in the opinion of the Board, it is necessary for this purpose, a Head Teacher must be appointed.

(*c*) The Board may decline to recognise a teacher in case of misconduct. In such a case they will use every available means of informing the teacher of the charges against him, and of giving him an opportunity for explanation.

19. The teachers must, as a rule, be paid by fixed salaries. They must not engage in any other employment which will prevent the efficient discharge of their duties as teachers.

20.—(*a*) The curriculum of each School must be suitable to the circumstances of the locality, and must be approved by the Board.

(*b*) The syllabus and time-table of the instruction to be given in each subject must be submitted to the Board. A copy available for reference must be kept on the School premises. The Board may require the modification of any syllabus which appears to be unsuitable.

21.—(*a*) The instruction should be co-ordinated with the educational provision of the area as a whole.

(*b*) Mere attendance at a course of lectures unaccompanied by class exercises will not, as a rule, be regarded as constituting satisfactory instruction. *University Extension Courses will only be recognised provided that each meeting is registered as a single period of instruction, and that at least half of each meeting other than the first is devoted to class exercises.*

(*c*) Where in the opinion of the Board it is necessary, the subjects taken in a School must be so combined as to provide Grouped Courses of instruction adapted to the needs of the different types of students in attendance, and arranged so as to be progressive from year to year.

(*d*) *Grouped Courses intended for students of the type indicated in Article* 25 (*a*), *whose ordinary employment or avocation occupies the greater part of their time, should be classified as follows:—*

(*i*) *Preparatory, if they are adapted to the needs of students who are under* 14 *or who require a*

21.—(*cont.*)

repetition of the work provided for scholars under 14 *in Public Elementary Schools.*

(*ii*) *Junior, if they are adapted to the needs of students who leave Public Elementary Schools at the age of* 14 *and proceed at once to a School recognised under Chapter* 2. *A complete Junior Grouped Course should as a rule extend over a period of two years.*

(*iii*) *Senior, if they are adapted to the needs of students who have passed through Junior Courses or who leave Day Schools of a higher grade than ordinary Public Elementary Schools at the age of* 15 *or* 16 *and proceed at once to a School recognised under Chapter* 2. *A Senior Grouped Course should extend over a period of at least two years.*

(*iv*) *Advanced, if they are adapted to the needs of older students and aim at reaching, within the limits of the subjects covered by them, the standard of University work.*

The classification set out above is for the purpose of fixing the standards of Grouped Courses. Individual students may be admitted to the Courses best fitted to their individual attainments.

22.—(*a*) The arrangements regulating the admission of students must be such as to exclude from a course or class any student who, from want of sufficient preliminary training, or other cause, is not qualified to take advantage of the instruction given in it. The grant may be withheld on account of any students whom the Inspector reports to be thus unqualified.

(*b*) The practical work of the students must not include a continued repetition of manipulative processes of which they have acquired a knowledge.

23. No grant will be paid in respect of any attendances lost, or on account of any period during which the School is closed for epidemic illness, but where the Board are satisfied that any failure to comply with the conditions of Articles 28, 29, 40, 41, 42, 45, 49, or 54 has been due to epidemic illness or other unavoidable cause, they may relax the conditions of those Articles so far as may be necessary to meet the case.

24. Where it is necessary on educational grounds that a course should extend over parts of two years, the Board may at their discretion treat the course for purposes of grant as belonging to either of those years.

CHAPTER 2.

Conditions of Grant specially applicable to "Evening Schools" and similar Schools and Classes.

25.—(*a*) Grants under this Chapter will, as a rule, only be payable on account of Schools or Classes intended for the instruction of those whose ordinary employment or avocation occupies the greater part of their time.

(*b*) Where application is made for the recognition of any School or Class meeting at an earlier hour than 4 p.m. (or, on Saturdays, 1 p.m.), the Board must be satisfied beforehand that the condition (*a*) is fulfilled.

26.—(*a*) Applications for recognition, or continuance of recognition, under this Chapter must be made to the Board on the prescribed Forms, which should reach the Board either by the 1st September in each year or at least two weeks before the instruction begins.

(*b*) If, after the application has been submitted, any material modification, such as the addition or omission of a course or of a subject in a course, is made in the curriculum of a School, a notification must be sent to the Board on the prescribed form at least two weeks in advance.

(*c*) In the case of applications for recognition or notifications of modifications in the curriculum received after the prescribed date, a deduction of 1 per cent. for each week of delay may be made from the grant otherwise payable.

27. Where Local Authorities or bodies of Managers have in contemplation the formation of short courses, or courses subject to special conditions, at a later period of the year, but are unable to supply particulars by the 1st September, it is desirable that they should at that time furnish the Board with such general information as may be possible regarding their proposals.

28. No grant will be made for instruction in any course in any subject in which less than 20 hours of

28.—(*cont.*)
instruction is given either in the year or as provided in Article 24; except that—

(*a*) Instruction in any subject for a less number of hours may be approved of as part of a Grouped Course satisfying the requirements of Article 29 (*b*);

(*b*) Short Courses of not less than 10 hours of instruction may be specially approved in certain subjects if they consist of concise and suggestive instruction given to students whose previous general familiarity with the subject enables them to profit by instruction of this kind. The Board will not, as a rule, recognise such Short Courses for students of less than 16 years of age, or in Arithmetic, English, and other subjects, *if treated as elements of general education*, but they will be prepared, for example, to recognise Short Courses for teachers in subjects other than Physical Exercises, Short Courses for adults in Ambulance or Sick Nursing, and Short Courses for women in the Management of Children or in Domestic Hygiene.

29.—(*a*) No student's attendance in any Course in any subject may be counted for grant unless he has received at least 14 hours of instruction in that Course either in the year or as provided in Article 24; except that—

(i) The attendances of students who have received at least 14 hours of instruction in a Grouped Course satisfying the requirements of Article 29 (*b*) *and carried out on lines accepted by the Board*, may be counted, even though the hours were in different subjects, if the number of hours received by all such students taken together amount to an average number of at least 60 for each such student or to at least half the total possible number of hours which might have been received by all such students taken together.

(ii) The attendance of a student at a Short Course specially approved under Article 28 (*b*) may be counted for grant if he has received at

29.—(*cont.*)

least two-thirds of the total number of hours of instruction included in the course.

(*b*) *For the purposes of this Article and of Article* 28 *no combination of subjects will be regarded as forming a Grouped Course if the Board have refused to accept it on educational grounds, or if it occupies less than four hours a week or eighty hours in all; except that the Board may relax these requirements as to duration in special cases such as short full-time vacation courses for teachers or courses for teachers held on Saturdays.*

30.—(*a*) Not more than 160 hours of instruction in subjects under the Preparatory Division and Divisions I. to V. of Article 32 may be counted for grant in a School for any student in one year.

(*b*) The Board may relax this condition in the case of a grouped course if application has been made to the Board for this purpose on the prescribed form, with full particulars of the course and conditions of attendance, before October 1st.

(*c*) No such relaxation will be allowed in the case of classes for Supplementary and Uncertificated Teachers in Elementary Schools preparing for the Board's Preliminary Examination for the Certificate or an equivalent Examination or for the Board's Certificate Examination.

(*d*) Not more than 60 hours of instruction in subjects under Division VI. of Article 32 may be counted for grant in a School for any student in one year.

31. The rates payable under Article 32 will be determined by the Board upon the character of the subjects taught, the extent to which organised and continuous courses of instruction are effectively carried out, and other evidence as to the work and circumstances of the School.

32.—(*a*) Subject to the foregoing conditions a grant may be paid for each complete 20 hours of instruction received by registered students in an approved subject or course of instruction.

(*b*) The rate of grant payable will be within the limits applicable to the Divisions in which the subject or course is included, and when a course includes subjects proper to different Divisions, the rate will be within limits intermediate between those applicable to these Divisions.

32.—(*cont.*)

The classification of instruction under "Divisions" is not intended in any way to limit the freedom of Local Education Authorities, Managers, or Teachers, in framing and conducting courses comprising subjects or combinations of subjects which are not definitely referable to one or other of the "Divisions" but are suited to the circumstances of the locality whether urban or rural.

PREPARATORY DIVISION.

(*c*) Under this Division may be recognised any instruction (except instruction of a kind for which provision is expressly made under one of the following Divisions of this Article) of a kind which may properly be included in a good elementary education.

(i) The rate of grant payable will, as a rule, be from 2*s.* 6*d.* to 3*s.* 6*d.*, except in the case of Singing, for which the rate will be from 1*s.* 6*d.* to 2*s.* 6*d.*

(ii) No lesson of less than one complete half-hour will be allowed to count as instruction in this Division.

DIVISION I.—LITERARY AND COMMERCIAL.

(*d*) (i) *Any Literary and Commercial subject may be accepted if a suitable Syllabus is submitted. The rate of grant for these subjects will, as a rule, be from* 2*s.* 6*d.* *to* 3*s.* 6*d.*, *but may, in the case of instruction of a higher standard than that appropriate to a Junior Grouped Course, be increased up to* 5*s. for Literary subjects and* 8*s.* 6*d. for Commercial subjects.*

(ii) *If a School provides instruction eligible for aid at more than one of these rates, the Board may alternatively assess a single rate, intermediate between* 2*s.* 6*d.* *and* 8*s.* 6*d.*, *for all the work of the School falling under Division I.*

(iii) No lesson of less than one complete half-hour will be allowed to count as instruction in this Division.

(iv) *Tutorial Classes conducted by University Bodies in connection with the Workers' Educational Association will be aided under separately issued Regulations.*

DIVISION II.—ART.

(*e*) (i) The ordinary rate of grant payable will be from 2*s.* 6*d.* to 3*s.* 6*d.*

(ii) The rate may be increased up to 15*s.*

32.—(*cont.*)

(iii) Subject to the conditions of Article 31, the rate will depend upon—

(α) the proportion of advanced work and of work requiring special equipment;

(β) the character and efficiency of the instruction and equipment;

(γ) the qualifications of the teacher; and,

(δ) in cases where the instruction is arranged with definite relation to the requirements of a particular craft, or group of crafts, and includes practical instruction in the craft methods necessary to illustrate corresponding systematic instruction in drawing, modelling, or design, the extent to which the course is concerned with principles and their application as distinct from practice in a craft with a view to the acquirement of manipulative skill.

(iv) No lesson of less than one hour will be allowed to count as instruction in Art.

Division III.—Manual Instruction in Wood, Metal, or other Materials.

(*f*) (i) The ordinary rate of grant payable will be from 2*s.* 6*d.* to 3*s.* 6*d.*

(ii) When special equipment has been provided, the rate may be increased up to 5*s.*

(iii) No lesson of less than one hour will be allowed to count as instruction in this Division.

Division IV.—Science.

(*g*) Any general or special branch of Science, including Mathematics, will be accepted, if a suitable syllabus is submitted.

(i) The ordinary rate of grant payable will be from 2*s.* 6*d.* to 3*s.* 6*d.*

(ii) The rate may be increased up to 15*s.*

(iii) Subject to the conditions of Article 31, the rate will depend upon—

(α) the proportion of advanced work and of work requiring special laboratory facilities and equipment;

32.—(*cont.*)

(β) the character and efficiency of the instruction and equipment;

(γ) the qualifications of the teacher; and,

(δ) in cases where the instruction is arranged with definite relation to the requirements of a particular trade, or group of trades, and includes practical instruction in the trade methods necessary to illustrate corresponding systematic instruction in the underlying scientific principles, the extent to which the course is concerned with principles and their application as distinct from practice in trade-processes with a view to the acquirement of manipulative skill.

(iv) No lesson of less than 40 minutes will be allowed to count as instruction in this Division.

Division V.—Home Occupations and Industries.

(*h*) Any course of instruction in Domestic Subjects, or in the proper performance of ordinary domestic duties or occupations, or in minor home industries, whether urban or rural, will be accepted, if a suitable syllabus is submitted.

(i) The rate of grant payable will, as a rule, be from 2*s.* 6*d.* to 3*s.* 6*d.*

(ii) In subjects, other than Needlework, which involve exceptional expenditure for materials and appliances, the rate of grant may be increased up to 5*s.* 6*d.*, provided that the teaching is satisfactorily illustrated by experiment, or that practical work is satisfactorily carried out by the students themselves.

(iii) No lesson of less than 40 minutes will be allowed to count as instruction in this Division.

Division VI.—Physical Exercises.

(*j*) Any course of Physical Exercises which aims at the general physical development of those attending it, and is adapted to the age and sex of those under instruction, will be accepted if a suitable syllabus is submitted.

(i) The ordinary rate of grant will be 1*s.* 6*d.*

(ii) The rate of grant may be diminished if the number attending a class at one time exceeds 20.

32.—(*cont.*)

(iii) Managers must use all reasonable endeavour to encourage those attending classes recognised under this Division to attend also classes recognised under some other Division.

(iv) No lesson of less than 30 minutes and no attendance of more than one hour on any one day will be recognised for the purpose of this Division.

Courses in Physical Training for Teachers must include instruction in the elementary theory of the subject and the methods of teaching it as a preparation for giving instruction in accordance with the Board's Syllabus of Physical Exercises for Schools. Such courses do not come exclusively under this Division, and are therefore not subject to the limitations (i) *to* (iv).

Fixed Annual Grant.

33. Provided that the arrangements and organisation of the work as a whole are satisfactory for the purpose, the Board may make a fixed annual grant in respect of any efficient school which occupies a definite place in the educational scheme of the area, and provides approved courses of organised instruction, arranged with due regard to the trade, industry, or employment of the students, and extending over four or more years. This grant will be equivalent in the first instance to the amount paid for the year immediately preceding. It will remain the same from year to year subject to re-assessment based upon the character, efficiency, and volume of the work of the School, or upon an estimation of the effect of any redistribution of work between the School and any other school to which grants are payable under these Regulations.

No School not previously aided under this Article will receive a Fixed Annual Grant for the year 1913–14.

34. *Cancelled.*

CHAPTER 3.

Conditions of Grant specially applicable to "Technical Institution Courses" and "Day Technical Classes."

35. Organised courses of instruction in Day Classes, including advanced instruction in Science, or in Science and Art, given with the aid of a staff and equipment

35.—(*cont.*)

adequate for the purpose, may be recognised as "Technical Institution Courses," and grants may be made to institutions in respect of courses so recognised under the Regulations contained in Articles 36 to 41.

36. Applications for recognition or continuance of recognition under Article 35 must be made to the Board on the prescribed Forms, which should reach the Board by the 1st September in each year.

37. Provision must be made for at least a two years' systematic course in Science, or in Science and Art, either alone or in conjunction with subjects of general, commercial, manual, or technological instruction.

38.—(*a*) No student may be admitted to the course unless either (1) he has been educated for at least three years, subsequent to the age of 12, in a School or Schools on the List of Secondary Schools Recognised by the Board of Education as Efficient; or (2) he is over 16 years of age and is qualified from his general education to profit by a course of advanced instruction.

(*b*) For the present, students may be admitted between the ages of 15 and 16, but the attention of the Inspector must be specially drawn to such students.

(*c*) *Courses in preparation for the Matriculation Examination of a University will not be recognised unless they are planned for students who are at least* 18 *years of age when they are admitted to the Course.*

(*d*) *Courses in preparation for the Intermediate Examinations for a University Degree in Science other than Engineering will not be recognised unless they are planned for students who have qualified for Matriculation and are at least* 17 *years of age when admitted to the Course.*

(*e*) *The Board for the present are prepared to consider applications for the admission of individual students under* 18 *years of age to Matriculation Courses or students under* 17 *years of age, who have qualified for Matriculation, to Intermediate Courses in Science other than Engineering, provided that the circumstances of each such student can be shown to be exceptional, and provided also, in the case of a student who has been in attendance at a Secondary School, that the Board may decline to entertain the application if not submitted before the student leaves the Secondary School.*

38.—(*cont.*)

(*f*) *Courses in preparation for the Intermediate Examination for a University Degree in Engineering may be recognised without the above limitations as to age, but must be confined to students who have qualified for Matriculation.*

39.—(*a*) No attendance of less than one hour's duration may be registered for any student.

(*b*) The Board may, in special cases, accept for a Technical Institution Course, in place of the system of registration prescribed by them under Article 14 (*a*), a system submitted by the Managers in advance of the School Year in which it is to be applied, and approved by the Board.

40.—(*a*) A grant may be paid for each student who receives not less than 800 hours' instruction in the year in an approved course, at a rate not exceeding 10*l*. for the first year's course, 12*l*. for the second year's course, and 15*l*. for the third and succeeding years' courses.

(*b*) If a student receives less than 800 but not less than 600 hours' instruction in the year in an approved course, a grant may be paid at three-fourths of the rate mentioned in (*a*).

(*c*) The rate of grant will be determined in each case by the Board, and will depend upon the time allotted to instruction in Science and in Art, upon the cost of the necessary equipment, upon the character and efficiency of the instruction as a whole, the manner in which the students have benefited by it, and its suitability to the special circumstances of the locality.

(*d*) If a student attends an approved course of instruction regularly for a certain period, but is precluded from completing 600 hours' attendance owing to a change of residence or of conditions of employment or some similar cause, a grant may be paid at one-half the rate mentioned in (*a*), if he receives not less than 400 hours' instruction, or at one-quarter of this rate, if he received less than 400 but not less than 200 hours' instruction.

41.—(*a*) Where the organisation of a course permits, proposals may be made for students other than those in full-time attendance to take part-time courses, including certain subjects only of the complete course. The Board must be satisfied that the presence of part-time

41.—(*cont.*)

students does not interfere with the progress of full-time students, and as regards each individual part-time student that it is not necessary for him to take the full course, and that the subjects selected for him are suitable. If they are so satisfied, and if the 800 or 600 hours of instruction contemplated by Article 40 have not been received by such students, a grant may be paid at one-half the rate mentioned in Article 40 (*a*) for each such student receiving not less than 400 hours' instruction or at one-quarter of this rate for each such student receiving less than 400 but not less than 200 hours' instruction.

(*b*) Except as provided in Articles 40 (*d*) and 41 (*a*), no grant will be paid for any student receiving less than 600 hours' instruction in the year.

Day Technical Classes.

42.—(*a*) In special cases grants may be paid in respect of instruction of students in Day Technical Classes, whether detached classes for advanced work or grouped classes affording organised instruction in related subjects adapted to the technical requirements of the students. The grant on account of any single student will not exceed 40*s*., except in the case of attendances in excess of 200 hours for work higher in standard than that of the first year's course of a Technical Institution, or, in the case of attendances in excess of 400 hours in other approved courses ; in these cases it may be increased up to 60*s*. The amount of the grant will be determined in each case by the Board, and will depend upon the number of hours of instruction received by registered students, on the cost of the necessary equipment, and upon the standard, character, and efficiency of the instruction and its suitability to the requirements of the students.

(*b*) *The provisions of Article* 38 (*c*)—(*f*) *will apply also to Courses proposed for recognition under Article* 42 (*a*).

(*c*) *No new Schools of the types for which provision is made in the Regulations for Junior Technical Schools or in the Regulations for Schools of Nautical Training will receive grant under this Article. Any Schools of those types which are now recognised under this Article may continue to be so recognised, if the Managers desire,*

42.—(*cont.*)
until the 31*st July*, 1915. *After that date all such Schools must conform to the provisions of the appropriate Regulations if they are to receive grant from the Board.*

43. Applications for recognition or continuance of recognition under Article 42 (*a*) must be made to the Board on the prescribed Forms, which should reach the Board by the 1st September in each year.

CHAPTER 4.

Conditions of Grant specially applicable to "Schools of Art" and "Art Classes."

44. An Institution giving organised courses of instruction, including advanced instruction, in Ornamental and Decorative Art, may be recognised as a "School of Art," and grants may be made to any institution so recognised under the regulations contained in Articles 45 to 52.

45. The work of a School of Art must be carried on methodically under *a recognised Principal Teacher and an adequate staff* in day and evening classes for not less than 36 weeks in the year. The *arrangements* for instruction and practice in the several subjects must be adequate. The day classes must meet for instruction on at least two days a week, and the evening classes on at least three evenings a week. The School must be open for instruction for not less than 14 hours each week, of which six at least must be in the daytime.

46. *In order to be qualified for recognition as a Principal Teacher, a teacher must hold the Board's Teaching Certificate for Teachers of Art, or the Full Associateship of the Royal College of Art, or an Art Master's Certificate* (*Group I.*), or, in exceptional circumstances, such special qualification as the Board may recognise.

47. The premises must be approved by the Board for the purposes of a School of Art, and must not be used for other purposes without the previous sanction of the Board. The class-rooms must be adequate, and suitably arranged and equipped for elementary and advanced instruction and study in Drawing, Painting, Modelling,

47.—(*cont.*)

and Design, and for such work in Ornamental and Decorative Art, in Design for manufactures, and in Art Handicraft as may be useful in the locality.

48. Applications for recognition or continuance of recognition under Article 44 must be made to the Board on the prescribed Forms, which should reach the Board by the 1st September in each year.

49. A Branch School of Art must be under the same Managers as the School of Art of which it is a Branch, and must be in the same district. It must have evening classes open three evenings a week for not less than 28 weeks in the year, and must be taught by a Teacher holding the Art Class Teacher's Certificate or a higher *qualification* and acting under the direction of the principal teacher of the School of Art, who must supervise the approved course of study and work to be followed at the Branch School.

Grant in respect of a Branch School of Art which is not recognised for the purposes of Article 51 (*c*) *and* (*d*) *as a Preparatory Department will be payable on the conditions laid down in Article* 32 (*e*).

50. Schools of Art must retain till the end of the Session, in a form convenient for inspection, Works executed or completed in the School by students during the Session. If all the Works of each student are not so retained, a sufficient selection *must* be filed to indicate his range of work and his progress in the course of the Session.

Fixed Annual Grant in respect of Schools of Art.

51.—(*a*) *An inclusive annual grant will be made in respect of every School of Art, and will be assessed by the Board after consideration of the volume, character, and merit of the work done in the School, and of the efficiency with which the work is organised and co-ordinated with that of other Schools and Classes in the locality.*

(*b*) *The grant will be made for the financial year extending from the* 1*st April to the* 31*st March, and the amount to be paid for each financial year will be announced to the School in advance of that year. This amount will not, for the financial year* 1914–15,

51.—(*cont.*)

ordinarily be less than the amount paid for the School Year 1912–13 *under Article* 51 (*a*) *or* (*b*) *of the Regulations in force for that year.*

(*c*) *The inclusive grant in respect of a School of Art may cover the work of a full-time or part-time Preparatory Department attached to the School.*

(*d*) *In assessing the grant to a School of Art the Board may take into account, in addition to the work done in subjects of Art—*

(*i*) *instruction in subjects of general education forming part of the Course of a Preparatory Department; and*

(*ii*) *instruction in literary or pedagogic subjects forming part of an organised Course specially approved by the Board for students of suitable types in the School of Art proper.*

Grant in respect of Art Pupil-Teachers.

52. *Subject to the conditions of the present Article, a grant not exceeding* £15 *in respect of any one year may be made to the Managers of a School of Art or Branch School of Art for each Art Pupil-Teacher recognised at the School. This grant is intended to assist Managers in training young, deserving, and qualified students to become teachers of Art.*

(*a*) *The School of Art must have a teaching staff sufficient to carry on the work of instruction without the assistance of an Art Pupil-Teacher.*

(*b*) *Not more than one Pupil-Teacher will be recognised in any School which has not at least* 30 *students in regular attendance. A second Pupil-Teacher may be recognised in a School which has at least* 50 *students in regular attendance, and, in exceptional cases, a third Pupil-Teacher in a School which has at least* 200 *students in regular attendance.*

(*c*) *The recognition of a candidate as an Art Pupil-Teacher will be subject to the following conditions:—*

(*i*) *The candidate must not be less than* 17 *or ordinarily more than* 21 *years of age on the* 1*st August in the year of his first appointment;*

(*ii*) *The candidate must have received a preliminary general education satisfactory to the Board. This should, as a rule, have reached the*

52.—(*cont.*)

standard represented by a Pass in the Preliminary Examination for the Elementary School Teacher's Certificate or in an Examination accepted as an equivalent thereto for the purposes of the new Teaching Certificate in Art (Rules 109). Where this condition is not satisfied the Board may exceptionally recognise the candidate as an Art Pupil-Teacher on condition that the Course provided for him includes some further subject or subjects of general study, but such acceptance will not necessarily involve ultimate acceptance of the Art Pupil-Teacher's general education for the purposes of the new Teaching Certificate;

(*iii*) *The candidate must have qualifications in Art satisfactory to the Board. For the present, the Board will be satisfied if the candidate—*

(*α*) *has passed the Board's Examination in Drawing or obtained First Classes in Freehand Drawing in Outline, Geometrical Drawing, and Model Drawing at the former Art Examinations; or*

(*β*) *has obtained First Classes in two of the subjects required for the Art Class Teacher's Certificate under the expiring Regulations and also has secured the acceptance of two works for that Certificate; or*

(*γ*) *is satisfactorily reported upon by the Head Master of the School of Art attended by him as to his attainments in Drawing, the probability of his being able ultimately to satisfy the technical requirements in Art for the new Art Teaching Certificate, and his aptitude for teaching, and submits as testimonies of study not less than three satisfactory exercises in each of the subjects mentioned in (α) above.*

(*iv*) *The candidate must declare his intention of taking up his Art Pupil-Teachership, if approved, with a view to his eventually becoming a Teacher of Art.*

52—(*cont.*)

(*d*) *The appointment of an Art Pupil-Teacher is renewable from year to year, but will not ordinarily be extended beyond the close of the School Year in which he attains the age of* 24 *years.*

(*e*) *A Pupil-Teacher must follow an approved Course of instruction and must, as a rule, attend the School of Art at which he is recognised, during at least* 20 *hours in each week for instruction in this Course and for practical training in the art of teaching. The Board may exceptionally approve other arrangements, but they will not ordinarily recognise as an Art Pupil-Teacher a person who is in other regular employment. The number of hours to be devoted to teaching practice in each year must not be less than* 100 *and not more than one-third of the total number of hours devoted to teaching and study taken together. All teaching done by an Art Pupil-Teacher must be under adequate supervision.*

(*f*) *Applications for recognition, or renewed recognition, of Art Pupil-Teachers must be made on the prescribed Form not later than July* 21*st.*

(*g*) *Before renewing recognition of a Pupil-Teacher previously recognised the Board must be satisfied that the Art Pupil-Teacher has made due progress in his studies and his teaching. In this connection the Managers will be annually required to submit testimonies of study showing the range and character of the Art Pupil-Teacher's work during the year, together with a statement of the number of hours spent by him in teaching, and of the number devoted by him to study, and a report from the Head Master of the School of Art as to his progress in his studies and his prospects of acquiring practical teaching capacity.*

(*h*) *An Art Pupil-Teachership is not tenable concurrently with a Local Scholarship awarded by the Board of Education or with a Local Art Exhibition.*

(*i*) *The claim for grant under this Article must be supported in each case by the Managers' certificate of the amount paid by them to each Art Pupil-Teacher for the School year. The amount of the grant under this Article will not exceed the amount so paid.*

53. (*Cancelled.*)

Art Classes.

54. An institution giving, in day or in day and evening meetings, an organised course of Art instruc-

54.—(*cont.*)
tion, including advanced instruction in Ornamental and Decorative Art, in Design for Manufactures, or Art Handicraft, and meeting at least three times a week for not less than 28 weeks in the year, may be recognised as an "Art Class."

NOTE.—The three meetings required to qualify the class for recognition under this Article may not all be held on the same day.

The Teaching Staff must include a Teacher who is qualified under Article 46 of these Regulations, or who holds the Art Class Teacher's Certificate.

The grant in respect of a class so recognised will be payable on the conditions laid down in Article 32 (*e*).

Application for recognition or continuance of recognition under this Article should be made to the Board on the prescribed Form, which should reach the Board by the 1st September in each year.

CHAPTER 5.

ENDORSEMENT OF CERTIFICATES AND DIPLOMAS.

55.—(*a*) *The Board are prepared to give special approval under the present Chapter to Schemes for the issue by Schools of Certificates in respect of Senior or Advanced Part-time Grouped Courses, or of Diplomas in respect of Senior or Advanced Full-time Grouped Courses, and to endorse the Certificates or Diplomas issued to students who satisfactorily complete their Courses in accordance with the approved conditions.*

(*b*) *Endorsement will not be given in respect of Courses for the training of teachers or for the preparation of teachers as such for special Examinations, or in respect of Courses of which the principal aim is to prepare students for Matriculation Examinations or for University Degree or Diploma Examinations.*

(*c*) *The Board may for the present endorse Certificates or Diplomas issued in respect of Courses which in their earlier years did not completely fulfil the prescribed conditions, provided that the conditions are fulfilled as regards the last year of the Course. They may also continue to endorse Certificates issued under Schemes approved under Article* 73 *of the Regulations for Technical Schools* 1909–10, *but in no case will the Board endorse a Certificate under this Article for any student whose Course was begun later than the Session* 1912–13.

56.—(*a*) *Part-time Courses are classified for purposes of endorsement in accordance with Article* 21 (*d*) *of these Regulations.*

(*b*) *No Part-time Grouped Course will be approved under this Chapter unless it is carried on for at least* 150 *hours for each session, and if the instruction is given exclusively in Evening Classes the Course should, as a rule, be carried on for three evenings a week during the School session.*

(*c*) *A Senior Part-time Grouped Course should extend over at least two sessions. Not less than* 150 *hours of instruction should be provided in each year of the Course.*

(*d*) *An Advanced Part-time Grouped Course will not be approved under this Chapter unless it extends over at least two sessions.*

57.—(*a*) *Full-time Courses are classified for the purposes of endorsement as follows:—*

(i) *Senior, if they are suitable for students who have attended a Secondary School up to the age of* 15 *or* 16. *A Senior Full-time Course must extend over two years.*

(ii) *Advanced, if they are suitable for students who have attended a Secondary School up to the age of* 17 *or* 18, *or for students who have been for two years in regular employment with concurrent attendance at Senior or Advanced Part-time Courses. An Advanced Full-time Course should extend over at least two years.*

(*b*) *Courses for Apprentices working under the system by which the student during alternate periods is under full-time instruction and in full-time employment are classified for the purpose of this Chapter as Full-time Courses, provided in each case that the amount of instruction given is equivalent to that provided in a continuous Full-time Course of two years' duration.*

58. *Before approving a Scheme the Board will require to be satisfied as to the equipment of the School for the purposes of the several Courses, the qualifications of the staff, the curriculum and syllabuses of instruction in the several subjects, and the steps to be taken to secure that students are not admitted to the Courses unless they are qualified to profit by them. The recognition of a School for grant under the preceding Chapters*

58.—(*cont.*)

of these Regulations will not necessarily imply that the conditions in regard to equipment, staff, &c. are such as the Board can accept for the purposes of a Scheme of endorsed Certificates.

59. *Particulars must be furnished indicating the several stages of the Courses at which internal Examinations will be held, and provision must be made for the holding in the final year of each Course of an Examination by the teachers in conjunction with an external Examiner or Assessor.*

60. *As a rule one Assessor only should be appointed for each Course, and if more than one is appointed for a Course, one of the number should be regarded as the Principal Assessor. Each person appointed as Assessor should, as a rule, possess not only technical or trade knowledge of the occupation to which the particular Course has reference, but also teaching experience in a Technical School. The names and qualifications of persons appointed as Assessors must be communicated for the information of the Board.*

61. *The Scheme must define the functions of the Assessors in relation to the preparation of the final tests, the marking of the worked exercises in the several tests, and the determination of the results of the final Examination as a whole. The Scheme must also provide that in case of any difference of opinion in regard to any of these matters, the decision of the Assessor, should he adhere to his opinion after discussion with the teacher or teachers, shall be conclusive. In case more than one Assessor acts for a Course, the final decision of points of doubt should rest with the Principal Assessor.*

62. *It will be a condition of the Board's approval of a Scheme that Certificates or Diplomas shall be issued only to those candidates who pass the prescribed Examinations. The further conditions of issue, e.g., as to attendance, homework, laboratory work, drawings, &c. must be submitted for approval. The Board reserve the right to call for the worked papers and the testimonies of the studies of any student to whom the issue of a Certificate or Diploma is proposed and for any School records of his attendance, &c. They may withhold their endorsement if they are not satisfied that the prescribed conditions are satisfied.*

63. *It will be a condition of the approval of a Scheme that no Certificate or Diploma shall be issued to students who fail to satisfy the prescribed conditions; but a sessional record, stating the facts of a student's attendance at instruction and so forth, may be issued at the completion of each stage of the Course, and will not be regarded as contravening this condition.*

64.—(*a*) *A student must, as a rule, take the whole of the Course at the School issuing the Certificate, provided that in the case of a Senior Part-time Course different years of the Course may, with the previous approval of the Board, be assigned to different Schools which are co-ordinated for the purpose, and that in the case of a student who migrates from one area to another, equivalent instruction at another School accepted for the purpose by the Managers of the School issuing the Certificate and by the Board of Education may be regarded as taken in lieu of any part of the Course other than the last year.*

(*b*) *A Scheme for Diplomas must, as a rule, provide that the whole of the Senior or Advanced Full-time Course shall be taken at one Institution, but arrangements by which certain portions of the Course are assigned to different Institutions may be exceptionally approved.*

65.—(*a*) *The text of any proposed Certificate or Diploma must be approved by the Board.*

(*b*) *Provision may be made for recording on Certificates successes in approved External Examinations; but successes in External Examinations may not, as a rule, be recorded on Diplomas.*

(*c*) *Successes at Internal Examinations may not be separately recorded on a Certificate or Diploma.*

Endorsement of Full Technological Certificates.

66. *For the present the Board will, on the application of the City and Guilds of London Institute, endorse Full Technological Certificates granted by the Institute under conditions approved by the Board.*

Universities and Training and Examination of Teachers.

Statement of Grants in aid of Technological and Professional Work in Universities [Cd. 6794.] Price 1*d.*; by post, 1½*d.*

Regulations for Science Scholarships. Price 1*d.*; by post, 1½*d.*

Prospectus of Whitworth Scholarships and Exhibitions. Price 1*d.*; by post, 1½*d.*

Reports from Universities and University Colleges, 1910–11:—
Vol. I. [Cd. 6245.] Price 1*s.* 11*d.*; by post, 2*s.* 3*d.*
Vol. II. [Cd. 6246.] Price 1*s.* 9*d.*; by post, 2*s.* 1*d.*

Report of Advisory Committee on distribution of Exchequer Grants to Universities, &c. [Cd. 6140.] Price 1½*d.*; by post, 2*d.*

Second Report of ditto. [Cd. 6617.] Price 1*d.*; by post, 1½*d.*

How to become a Teacher in a Public Elementary School. Price 4*d.*; by post, 5*d.*

Regulations for the Training of Teachers for Elementary Schools, 1913. [Cd. 6795.] Price 6*d.*; by post, 8*d.*

Regulations for the Training of Teachers of Domestic Subjects. [Cd. 4603.] Price 1½*d.*; by post, 2*d.*

Regulations for Training of Teachers for Secondary Schools. [Cd. 4753.] Price 1*d.*; by post, 1½*d.*

List of Training Colleges, &c. (Elementary), showing Accommodation, Fees, Courses, and Examinations. Price 3*d.*; by post, 4*d.*

Syllabus of Preliminary Examination for Certificate, 1914. Price 1*d.*; by post, 1½*d.*

Syllabuses of the Certificate Examinations, 1913, 1914. Price 1*d.* each; by post, 1½*d.*

Examination Papers set at the Preliminary Examination for the Elementary School Teachers' Certificate, 1913. Price 6*d.*; by post, 7*d.*

Examination Papers set at the Certificate Examination, 1912. Price 6*d.*; by post, 7*d.*

List of Persons who have passed the Preliminary Examination for the Elementary School Teachers' Certificate, 1912. [List 30, 1912.] Price 6*d.*; by post, 7½*d.*

List of Training College Students who completed training on 31st July 1912, and qualified by examination for recognition as Certificated Teachers, 1912. [List 19.] Price 6*d.*; by post, 9*d.*

List of Persons who have passed the Certificate Examination of the Board of Education for Teachers in Elementary Schools, 1912. [List 24.] Price 6*d.*; by post, 7*d.*

Secondary Schools and Pupil-Teacher Centres.

Regulations for Secondary Schools, from 1st August 1909. England [Cd. 4691]; Wales [Cd. 4696]. Price 2*d.*; by post, 3*d.*

Regulations for the Preliminary Education of Elementary School Teachers. England [Cd. 4628]; Wales [Cd. 4656]. Price 3*d.*; by post, 4*d.*

List of Efficient Secondary Schools and recognised Pupil-Teacher Centres in England, 1911–12. [List 60.] Price 9*d.*; by post, 11*d.*

Building Regulations for Secondary Schools and Pupil-Teacher Centres. [Cd. 3865.] Price 2*d.*; by post, 2½*d.*

Report for 1911 under Welsh Intermediate Education Act. (H.C. 154; 1912.) Price 1½*d.*; by post, 2*d.*

Report of Consultative Committee on Examinations in Secondary Schools, 1911. [Cd. 6004.] Price 2*s.* 6*d.*; by post, 2*s.* 11*d.*

Teaching of English in Secondary Schools (Circular 753). Price 2*d.*; by post, 2½*d.*

Music in Secondary Schools. Form 125 S. (G.) Price 1*d.*; by post, 1½*d.*

Manual Instruction in Secondary Schools. [Circular 740.] Price 1*d.*; by post, 1½*d.*

Pronunciation of Latin. [Circular 707.] Price 1*d.*; by post, 1½*d.*

Teaching of Latin in Secondary Schools. [Circular 574, for England; or Wales, Circular 1.] Price 1*d.*; by post, 1½*d.*

Teaching of History in Secondary Schools. [Circular 599.] Price 1*d.*; by post, 1½*d.*

Teaching of Housecraft; Interim Memorandum. Price 4*d.*; by post, 5½*d.*

Teaching of Modern Languages. [Circular 797.] Price 3*d.*; by post, 4*d.*

Teaching of Needlework. [Circular 719.] Price 1*d.*; by post, 1½*d.*

Memorandum on Physical Training in Secondary Schools. [Circular 779 for England; or Wales, Circular 40.] Price 2*d.*; by post, 2½*d.*

Technology, Evening Schools, and Higher Education in Science and Art.

Regulations for Technical Schools, Schools of Art and other Forms of Provision of Further Education, 1910–11. Part I.—Grant Regulations. [Cd. 5329.] Price 2*d.*; by post, 3*d.*

Regulations, dated 7th June 1912, modifying the above. [Cd. 6233.] Price ½*d.*; by post, 1*d.*

Regulations and Syllabuses for Examinations in Science and Technology, 1913. Price 3*d.*; by post, 4*d.*

Regulations for Examinations in Art, 1913. (Rules 110). Price 2*d.*; by post, 3*d.*

Regulations for Scholarships, &c. in Art, 1913. Price 1*d.*; by post 1½*d.*

Rules as to Certificates for Teachers of Art (Rules 109). Price 1*d.*; by post 1½*d.*

List of Day Technical Courses and of Schools of Art, 1910–11. [List 111.] Price 3*d.*; by post, 4*d.*

Report of Departmental Committee on Royal College of Art. [Cd. 5810.] Price 6*d.*; by post, 7½*d.*

Prospectus of the Royal College of Art, 1912–13. Price 3*d.*; by post, 4*d.*

BOARD OF EDUCATION.

REGULATIONS

FOR

TECHNICAL SCHOOLS, SCHOOLS OF ART, AND OTHER FORMS OF PROVISION OF FURTHER EDUCATION

IN

ENGLAND AND WALES.

(In force from 1st AUGUST 1913.)

Presented to both Houses of Parliament by Command of His Majesty.

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BOARD OF EDUCATION.

REGULATIONS DEALING WITH GRANTS AND LOANS IN AID OF MUSEUMS, EDUCATIONAL EXHIBITIONS AND SCHOOLS.

Presented to both Houses of Parliament by Command of His Majesty.

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Part IV. of the Regulations for Technical Schools, Schools of Art, and other forms of provision of further education in England and Wales (in force from 1st August 1909 to 31st July 1910) [Cd. 4736] dealing with Grants and Loans in aid of Museums, Educational Exhibitions, and Schools, will be continued in force pending the issue of a revised body of rules dealing with these matters.

L. A. SELBY-BIGGE.

13*th August* 1913.

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(11)18970 Wt 18120—G 1859A 4000 8/13

Special Studentships for Teachers of Art.

14. The Board are prepared to nominate a *limited number* of Teachers of Schools of Art or Art Classes for attendance at courses of *advanced* instruction at the Royal College of Art. A Candidate for these Studentships must be a British subject and must hold the Art Master's Certificate, Group I.

These awards may not be held concurrently with a local Science or Art Exhibition or any of the Board's Scholarships, etc., but, subject to the sanction of the Board, they may be held concurrently with other scholarships or aid granted by Local Authorities.

15. Teachers selected for these awards are nominated in the first instance for a term or for a session, but if in the case of anyone so nominated the Board consider it desirable to prolong the period of his instruction in the college his tenure of the studentship may be extended for further terms, so however that it shall not continue for more than two years in all.

16. Teachers holding these awards will be entitled to free admission to the work of the approved course at the Royal College of Art, to a maintenance allowance of 60*l.* a year for the duration of the courses to which they are nominated, and to third-class railway fare for one journey per session between their homes and London.

17. Candidates for these awards should have sufficient knowledge of Art to enable them to enter at once upon the courses to which they are nominated, and will be required to furnish on the prescribed form particulars of their education and training and teaching experience.

Part IV.

GRANTS AND LOANS IN AID OF MUSEUMS, EDUCATIONAL EXHIBITIONS, AND SCHOOLS.

Note.—All communications under the two following Chapters should be addressed to the Secretary, Circulation Collections, Victoria and Albert Museum, South Kensington, London, S.W.:—

CHAPTER 10.

Grants in aid of Purchases by Local Museums.

84.—(i) The grants are primarily intended to assist Provincial Museums in purchasing reproductions, in plaster or by electrotype or other process, of objects illustrating architectural, ornamental, and other decorative Art.

Grants may also be made towards the purchase of original objects of similar character, but in considering applications, preference will as a rule be given to those for reproductions.

*Grants may also be made towards the purchase of objects illustrative of scientific investigations.

This aid is not given in respect of appliances and examples such as are necessary to the equipment of Schools or Classes approved by the Board.

In no case will the grant be made until the objects have been approved by the Board.

(ii) Where the Managers are not the Local Education Authority of the area in which the Museum is situated, the Board may consult the Local Education Authority before making a grant.

When there are two or more Museums in the same locality, the Board will consider the provision of Museum facilities in the locality as a whole, and the allocation of interests among the several Museums.

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* The arrangements for these grants and for the loan of illustrative collections of scientific apparatus under Art. 85 below are under revision.

84.—(*cont.*)

(iii) Application for the Board's approval of the objects towards which aid is desired must be accompanied by—

(*a*) Information of the objects in detail, together with their cost. In cases where the application to the Board has not been made prior to the acquisition of the objects, its consideration will be exceptional, and in no case will a grant be made in respect of an object after twelve months from its acquisition.

(*b*) Where not already supplied to the Board, a copy of the rules under which the Museum is administered, including those for the admission of visitors and of students.

(iv) No grant is made towards the cost of carriage of the objects; and no object in respect of which aid has been granted may be sold or exchanged without the permission of the Board.

(v) The grant will in no case exceed one-half the cost of the objects purchased; and it must be met by at least an equal amount raised locally by rate or contribution, exclusive of any sum received under the Local Taxation (Customs and Excise) Act, 1890.

(vi) When the Board's approval has been given, the grant will be paid upon the receipt of the Certificate Form 132a.T. supported by the original vouchers with the receipts of the vendors, and copies in duplicate thereof.

(vii) The Museum in which the objects are exhibited must be at all times open to the inspection of the Officers of the Board.

(viii) A report on the Museum, containing a return of the number of persons who have visited it during each month, must be forwarded annually to the Board as soon as possible after the 31st December.

(ix) All applications must be made before October 1st in each year on Form 132.T.

(x) It must be understood that a grant cannot necessarily be made by the Board in all cases where it can be shown that the objects proposed to be purchased are such as could be approved for the purpose by the Board, and that the foregoing conditions would be fulfilled.

CHAPTER 11.

Loans to Museums, Educational Exhibitions, and Schools.

85. Collections of objects of Art* may be lent to Museums, Educational Exhibitions and Schools approved by the Board, on the following conditions :—

(i) That the objects lent by the Board are supplemental to others of a similar nature contributed by the locality.

(ii) That adequate provision, previously approved by the Board, is made for their exhibition.

(iii) That their security and safe return are guaranteed. Valuable original objects will only be lent to Institutions in which efficient arrangements are made for their safe custody; one condition being that a sufficient number of attendants will be employed to patrol the premises containing the loan collections during the whole day and night.

(iv) That they are insured against all risks for the period of their absence from the Board's custody.

(v) *Applicable only to Permanent Museums :*

(*a*) That the Museum consists of at least one room entirely devoted to the exhibition of objects.

(*b*) That the Museum is open to the public, both during the day-time and in the evening, and is open free at least one day and one evening in each week.

(*c*) That the receipts, if any, are applied for the benefit of the Museum.

(*d*) That the Municipal or Local Authority pay, in respect of the expenses, a fixed charge of fifty shillings for each van needed to convey the objects to the Museum, and defray any local expenses ; and that they provide sufficient assistance for the proper arrangement of the collection.

(vi) *Applicable only to Temporary Exhibitions :*

(*a*) That the Exhibition is open to the public, both during the day-time and in the evening.

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* *See* note on page 58.

85.—(*cont.*)

(*b*) That arrangements satisfactory to the Board are made for the free admission of students, and for the admission of artisans who are not students at a reduced rate on certain evenings; and that in the event of the Exhibition remaining open more than three months it is free at least on one day and one evening in each week.

(*c*) That any surplus in the receipts is applied for the benefit of the School or Museum with which the Exhibition is connected.

(*d*) That the Managers, or the Municipal or Local Authority pay, in respect of the expenses, a fixed charge of fifty shillings for each van needed to convey the objects to the School or Educational Exhibition, and defray any local expenses; and that they provide sufficient assistance for the proper arrangement of the collection.

(vii) The Board may require that any application for a loan under this Article shall be supported by the Local Education Authority.

(viii) The Board will consult so far as possible the wishes of applicants as to the nature of objects to be lent, but will themselves decide in every case as to the lending of objects, or the continuance of any loan.

(ix) If any object be received in a damaged state, when not in charge of an officer of the Board, a report of its condition should immediately be sent to the Board.

(x) Glass cases for the objects belonging to the Board which require protection, will be provided by the Board, and every object will be accompanied by a descriptive label. Such glass cases must on no account be moved except under the supervision of the officers of the Board.

(xi) In the case of Permanent Museums, the collections lent from time to time by the Board will be withdrawn in each case at the expiration of not less than twelve months.

(xii) Applications for loans under this article should be made on Form 605 Circn.

86. (i) The Board of Education also aid Schools of Art and Art Classes by the loan of objects, books, paintings, drawings, lantern slides, and of examples of students' work, etc.

(ii) In the case of approved Art Classes loans, except of students' works, are only made where there is a room wholly devoted to instruction in Art.

(iii) Application for the loan of books and students' works should be made on Forms 273 Circn. and 159 Circn. respectively.

(iv) Loans of objects or examples likely to be useful to classes at which training in Art Crafts is given may also be made for short periods to other Schools recognised under these Regulations.

(v) The Managers are required to defray the cost of carriage from South Kensington to the School. The charges for the return carriage will be paid by the Board.

ROBERT L. MORANT.

24th June 1909.

BOARD OF EDUCATION.

REGULATIONS

FOR

UNIVERSITY TUTORIAL CLASSES

IN

ENGLAND AND WALES.

(In force from 1st AUGUST 1913.)

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1913.

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BOARD OF EDUCATION.

Regulations for University Tutorial Classes, 1913–14.

1.—(*a*) The Board of Education will be prepared to make special grants, subject to the requirements of these Regulations and of Articles 1 to 25 of the Regulations for Technical Schools, &c. in aid of part-time Courses in subjects of general as distinct from vocational education, given under the educational supervision either of a University or University College, acting directly or through a Committee or Delegacy, or of an educational body containing representatives of a University or University College, and constituted expressly for such supervision.

(*b*) The University or supervising body must be responsible for the framing of the syllabus and the selection of a suitable tutor.

(*c*) The instruction must aim at reaching, within the limits of the subject covered, the standard of University work in Honours.

2. The Course must extend for each class over a period of not less than three years, and must occupy at least two hours a week for 24 weeks in each year, at least one half of the time being devoted to class work.

3.—(*a*) Arrangements must be made to the satisfaction of the Board for regulating the admission of students to each class, and for ensuring regularity of attendance and written work by the students.

(*b*) The number of original students admitted to any class for a Course beginning in 1913–14 or later must not exceed 32. In future years the Board may require the number of original students not to exceed 24.

(*c*) The roll of original students must be made up not later than the third meeting of the first year of the Course, and must be at once forwarded to the Board. For classes whose Course began before 1913–14 the Board will decide, after an inspection of the registers for the first year, which students are to be regarded as having been original students.

(*d*) Added students, whose attendances will not be taken into account for purposes of grant, may be admitted after the roll has been closed, provided that the tutor is satisfied that they are able to take up the work at the stage which has been reached by the class, and that their admission does not bring the total number of original and added students on the register for any year of the Course to more than 24.

4. If a teacher conducts more than one class of this type, or conducts a class or classes in addition to other regular teaching work, the Board must be satisfied that he has adequate time available for the efficient conduct of the class.

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5.—(*a*) Provided that the Regulations are satisfied and the instruction efficient, the Board will make a grant in respect of each class for each year of the Course, to the amount of 30*l*. or half the fee, exclusive of travelling and similar expenses, paid to the tutor, whichever may be the less, provided that the number of original students who attend not less than 66 per cent. of the meetings of the class during the year, and do such written work as may be required by the tutor, reaches not less than two-thirds of the total number of original students or 12 in all (whichever is the higher) for a class in its first year, half the number of original students or 9 in all for a class in its second year, and one-third of the number of original students or 6 in all for a class in its third or any later year.

(*b*) A proportionate deduction will be made from the full grant for each unit by which the number of original students in regular attendance falls below the number required of the class for the full grant.

(*c*) In order to be registered as in attendance at a meeting, a student must have arrived not more than 10 minutes after the beginning of the meeting and must have left not more than 10 minutes before the end of the meeting.

6.—(*a*) Grant will be paid by the Board to the University or other supervising body in respect of each class under its supervision, except that it may be paid to a Local Education Authority if the Authority takes full financial responsibility for a class and requests the grant to be so paid.

(*b*) Every University or other supervising body will be required to furnish to the Board an annual statement of accounts in connection with tutorial classes, in a form prescribed by the Board.

7. The Board may make such additional grants as they may think fit in respect of vacation Courses for selected students organised in connection with classes aided under these Regulations.

8. Classes whose Course began in or before 1912–13 will have the alternative of receiving grant for that and subsequent years under Article 32 (*d*) of the Regulations for Technical Schools, 1910.

17*th June*, 1913. L. A. SELBY-BIGGE.

BOARD OF EDUCATION.

REGULATIONS

FOR

SCHOOLS OF NAUTICAL TRAINING

IN

ENGLAND AND WALES.

(In force from 1st AUGUST 1913.)

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BOARD OF EDUCATION.

Regulations for Schools of Nautical Training.

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1. Day Schools providing a continued full-time education under School conditions for pupils from Elementary Schools in preparation for employment at sea will be recognised and, if efficient, aided with grant by the Board subject to the requirements laid down in the present Regulations.

2.—(*a*) The curriculum of a School recognised under these Regulations must provide for the continuance in a modified form of the education given in Public Elementary Schools, including Physical Training. Provision must also be made for practical instruction of a progressive character in all suitable branches of Seamanship. If the School provides a preparation for the Royal Navy, instruction must be given in Squad Drill, which should be taught by a Naval Pensioner approved by the Board.

(*b*) Visits of pupils to suitable places connected with the subjects of their Course will be approved as part of their instruction.

3.—(*a*) A Course of Nautical Training must be organised to cover not less than one and not more than two years, to occupy not less than 40 weeks in each year.

(*b*) With the consent of the Board a period of practical experience on a sea-going tender under conditions of instruction approved by the Board may be accepted as part of a course of training under these Regulations.

(*c*) The age limits for the admission of pupils must be such as the Board may approve for each Course; but Schools should normally be planned to provide either a two-year Course for pupils aged between 13 and 14 on admission, or a shorter Course of at least one year's duration with a correspondingly later age of admission. It is advisable that the Board should be consulted upon all proposals for Courses of less normal types at an early stage.

4.—(*a*) The grant to the Responsible Body for each pupil who completes the approved Course will be proportionate to the length of the Course, and at the rate of 10*l.* per year.

(*b*) If the approved Course lasts for more than a year the Board may pay a proportionate part of the grant for pupils who have been in residence in the School and in regular attendance at the Course for less than its full duration, but no grant will be payable for any pupil who has been in attendance at the Course for less than one year.

O (11)16972 Wt 11184 4000 6/13 E & S

(*c*) No pupil will be taken into account for the purposes of grant for any longer period than that of the approved Course.

(*d*) No pupil can be regarded as entering upon the approved Course, or as beginning to satisfy any of the conditions of grant, before reaching the age of 13 years.

(*e*) The Board will make special arrangements for grant in respect of those pupils in attendance after the date from which the School is recognised under these Regulations, who were also in attendance before that date.

(*f*) No grant will be paid in respect of a closed School in excess of the net outstanding liabilities on the maintenance account, except in the case of a School for which the Responsible Body is a Local Authority.

(*g*) The grant must be expended to the satisfaction of the Board.

5.—(*a*) A general Time Table must be submitted for the approval of the Board, showing the daily routine of the Institution, and clearly indicating the periods during which the pupils receive instruction in each subject of the approved curriculum. The Time Table will not be approved unless it provides for an adequate amount of instruction in the subjects of the approved curriculum to be normally given in each week before 6 p.m. In the case of a ship reasonable account will be taken of the training involved in the performance of necessary ship's duties.

(*b*) The provision for vacations must be such as the Board can accept as satisfactory.

(*c*) The conduct of the School must be such as to encourage a corporate life, and to afford opportunities for reasonable recreation.

6.—(*a*) Arrangements approved by the Board must be made for testing the progress of the pupils.

(*b*) Every pupil admitted to the School must regularly attend the full course of instruction, and no boys not being pupils of the School of Nautical Training may be instructed with such pupils.

(*c*) Recognition may be withdrawn if a reasonable number of pupils do not year by year remain to the end of the Course.

(*d*) No pupil may be admitted unless a certificate is given by his parent or guardian that he is intended for the sea. An indenture of apprenticeship will be accepted as equivalent to a certificate.

(*e*) No pupil may be admitted to the Course unless a certificate has been given by the Medical Officer of the School in a form approved by the Board that he is physically fit for employment at sea.

(*f*) A record must be kept of the employment of pupils during a period of three years after leaving the School. The

Board may withdraw recognition from a School if they are not satisfied that a reasonable proportion of the pupils go to sea and continue in that employment for a satisfactory period.

7. The number of pupils in a class under the supervision of a single teacher should not exceed 32 for ordinary class work.

8. Educational responsibility for the School and financial responsibility for its maintenance, in so far as its expenses are not met out of grants and fees, must be undertaken by the same Responsible Body, which must be either a Local Authority exercising powers under Part II. of the Education Act, 1902, or a Joint Body formed by Local Authorities exercising such powers, or the Governing Body of a Charitable Foundation.

9.—(*a*) The School must be managed under and in accordance with a Scheme or Minute or body of written Regulations which determines the constitution of any Governing or Advisory Body established for the School, and defines the functions of any such Body and of the Superintendent of the School. The Instrument of Government must be approved by the Board, with whom a copy thereof as approved must be deposited, and its provisions must not be varied or departed from without the approval of the Board.

(*b*) The Instrument of Government must provide, unless the Governing Body already contains persons having a close practical acquaintance with the conditions of employment at sea, for the appointment of an Advisory Body containing such persons.

10.—(*a*) The School must be conducted with the aid of an efficient teaching staff which is adequate for conducting the instruction provided in the approved curriculum.

(*b*) A reasonable proportion of the members of the teaching staff must have had practical experience of employment at sea.

11.—(*a*) The premises must be sanitary, convenient for teaching purposes, and provided with adequate equipment and appliances for the approved curriculum of the School.

(*b*) Suitable facilities must be provided for recreation and physical exercises.

(*c*) It is desirable that a School of Nautical Training should have its own separate premises. If this condition is not satisfied the arrangements as to the use of the premises by the School recognised under these Regulations and by any other School or Department must be submitted in detail for the approval of the Board.

(*d*) The plans of premises for new Schools or for increased accommodation for existing Schools must be submitted to the Board for approval. Such particulars of existing premises must be submitted as the Board may require in each case.

12.—(*a*) No aid will be given under these Regulations in respect of instruction in religious subjects.

(*b*) A pupil shall not be required, as a condition of being admitted to or remaining in a School recognised under these Regulations, to attend or abstain from attending any Sunday school, place of religious worship, religious observances, or instruction in religious subjects in the School or elsewhere; and the times for religious worship or for any lesson on a religious subject shall be conveniently arranged for the purpose of allowing the withdrawal of any such pupil therefrom at the instance of his parent or guardian.

13.—(*a*) The School must not be conducted for private profit or farmed out to any member or members of the teaching staff, and must be eligible from its character and financial position to receive aid from public funds.

(*b*) The Board must be satisfied that the School is not unnecessary, having regard to the existing supply of Schools of the same type.

14. The School may be with or without fees, but any scale of fees must be approved by the Board.

15.—(*a*) Application to the Board for placing a School on the list of Schools recognised for grants under these Regulations must be made by the Responsible Body on a form of preliminary statement which will be supplied by the Board.

(*b*) Recognition, when given, will ordinarily be continued from year to year without a further application, but may be withdrawn at any time by the Board.

(*c*) The date from which recognition will be held to begin will be the 1st August unless some other date is specially approved by the Board.

16. A full statement of the organisation and curriculum of the School must be submitted for the approval of the Board. When approval has once been given the statement need not again be submitted so long as no alteration is required by the Board or desired by the Responsible Body.

17.—(*a*) Instruction must be given in accordance with the approved time-table, which must not be permanently altered without the approval of the Board. Whenever possible previous notice of temporary deviations should be sent to the Inspector.

(*b*) Notice must be sent to the Inspector, as soon as is possible in each case, of every date on which the School will be closed or its ordinary work suspended.

(*c*) Cases of closure under order of a medical or sanitary authority, or for other unavoidable cause, must be notified to the Board, and due consideration will be given to these in determining whether the Regulations have been satisfied, and in the award of grant.

18. A full account of the income and expenditure of the School must be furnished annually in such form as the Board

may require. Except with the express approval of the Board in advance, all accounts must be made up to 31st March in each year.

19.—(*a*) The School, including the arrangements for boarding and lodging, must be open at all reasonable times to inspection by the Board.

(*b*) All registers and other records prescribed by the Board must be regularly kept, and, if required by the Board through their Inspector or otherwise, must be submitted for inspection forthwith.

(*c*) All returns called for by the Board must be duly made.

(*d*) A copy of these Regulations, available for reference, must be kept at the School.

20.—(*a*) If any of the conditions of award of grant are not fulfilled the Board may withhold the grant, or, if they think fit, pay it with or without deductions, and may warn the Managers that a grant will not again be paid in similar circumstances.

(*b*) The decision of the Board as to whether the conditions have been fulfilled in any case, or as to the application or interpretation of these Regulations, is conclusive.

L. A. SELBY-BIGGE.

19*th June* 1913.

BOARD OF EDUCATION.

REGULATIONS

FOR

JUNIOR TECHNICAL SCHOOLS

IN

ENGLAND AND WALES.

(In force from 1st August, 1913.)

Presented to Parliament by Command of His Majesty.

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PREFATORY NOTE.

1. Among the educational developments of recent years none have been more interesting and important than the growth of Junior Technical Schools—that is to say, Day Schools which provide Courses for boys and girls for two or three years after leaving the Public Elementary Schools, and which continue the general education of their pupils while at the same time aiming at preparing them for industrial employment. The growth of these Schools has undoubtedly been in response to a definite educational need, the need, namely, of those who can afford some time for the continuation of their full-time education beyond the normal age for leaving the Public Elementary School before entering upon industrial life. Fostered by the interest of Local Education Authorities and aided in many cases by the ready co-operation of those actually engaged in industry, whether as employers or employees, these Schools have now reached a point of development at which they may fairly claim to constitute a distinct educational type, and to require special treatment under the Board's Regulations.

2. Junior Technical Schools have hitherto been aided by Grants from the Board under Article 42 of the Regulations for Technical Schools. It is the purpose of the following new Regulations to recognise that the Schools have emerged from the experimental stage, to detach them for administrative purposes from the somewhat miscellaneous body of work at present aided under Article 42 and, by means of the increased Grants now made available, to encourage the establishment of more Junior Technical Schools and to strengthen and improve the work of those which have already been established.

3. These new Regulations are not intended to promote the establishment of Courses planned to furnish a preparation for the professions, the Universities, or higher full-time technical work. The establishment of such Courses is work appropriate to Secondary Schools and will not therefore be aided under these Regulations. Nor will Courses specially planned as a preparation for commercial life be aided under these Regulations. Full-time Junior Courses, however, planned to prepare for commercial life may be provisionally recognised under

Article 42 of the Regulations for Technical Schools in places where the supply of Secondary Education is adequate and the circumstances are otherwise suitable. Such Junior Commercial Courses should normally be planned to extend over a period of two years for pupils leaving the Elementary Schools at the age of 13 or 14. The Board will consider upon its merits each application made for the recognition of a Junior full-time Commercial Course under Article 42, but they are not at present in a position to lay down any precise rules governing such recognition.

L. A. Selby-Bigge

4 *July* 1913.

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Regulations for Junior Technical Schools.

1. Day Schools, organised as part of the system of higher education, and providing a continued full-time education under school conditions for pupils from Elementary Schools in preparation either for artisan or other industrial employment or for domestic employment, will be recognised and, if efficient, aided with Grant by the Board, subject to the requirements laid down in the present Regulations, and to the provisions of Article 1 and Chapter I. of the Regulations for Technical Schools, Schools of Art, &c., 1913–14, in so far as those provisions are not inconsistent with these Regulations. With the approval of the Board, industrial and domestic Courses may be provided in a single School.

2.—(*a*) The curriculum of a School recognised under these Regulations must provide for the continuance of the moral, intellectual, and physical education given in Public Elementary Schools. It must be suitable, as regards both the subjects and the methods of instruction, to the circumstances of the locality and the attainments and prospects of the pupils, and must provide for due continuity of instruction in each of the subjects taken, and for an adequate amount of time being given to each of these subjects. The Board may require modifications in the curriculum or the time-table if a subject is taught which is not of educational value, or if the time spent on particular subjects interferes with proper instruction in other subjects, or if the time given to any subject is insufficient to allow of effective progress being made in it, or for other similar reasons.

(*b*) The inclusion of languages, other than English or Welsh, in the curriculum will not be approved, unless such instruction can be shown to be of direct vocational value in connection with the occupations for which a preparation is provided.

(*c*) Practical work will be required in all suitable subjects, and must be of a progressive character throughout the Course.

(*d*) Visits of pupils to suitable works, museums, galleries, and other places connected with the subjects of their Courses, will be approved as part of the instruction.

3.—(*a*) Each Course must be organised to cover not less than two and not more than three years, to occupy the whole time of the pupils to the exclusion of any regular employment during six or nine terms, and to extend over not less than 36 weeks in each year.

(*b*) Where it is desired that technical instruction in preparation for an occupation shall alternate with practical experience of that occupation in works or elsewhere, a Course may, with the consent of the Board, be organised, with intervals between its terms, so as to provide for such alternation.

(*c*) The age-limits for the admission of pupils will be such as the Board may approve for each Course; but Schools should normally be planned to provide for pupils leaving the Elementary Schools at the age of 13 or 14 courses of instruction extending over two or three years up to the age of about 16. It is advisable that the Board should be consulted upon all proposals for Courses of less normal types at an early stage.

(*d*) A School will not as a rule be recognised, unless there is reason to anticipate the annual admission of a reasonable number of pupils.

4.—(*a*) Grant will be paid to the Responsible Body after the close of the school year on account of each pupil receiving regular and efficient instruction in acccordance with an approved curriculum, at the rate of 3*l*. per annum for pupils under 13 on the day preceding the school-year, and 5*l*. for older pupils. The amount of the grant may be increased to not more than 7*l*. in respect of Courses involving exceptionally costly methods of instruction.

(*b*) For the purpose of calculating the Grant, the number of pupils in each term during the school year will be taken, and the sum of these numbers divided by the number of terms will be the number on which Grant is payable.

(*c*) No pupil will be taken into account for the purposes of Grant whose attendance has not been registered at 80 per cent. of the meetings for his Course during the term, except in the case of absence owing to certified illness or risk of infection.

(*d*) No pupil who is regarded by the Board as unfit to continue in the Course or in the Class in which he is

being taught will be taken into account for purposes of Grant.

(*e*) No pupil will be taken into account for the purposes of grant for more than one term in excess of the number of terms of the approved Course.

(*f*) No Grant will be paid in respect of a closed School in excess of the net outstanding liabilities on the maintenance account, except in the case of a School for which the Responsible Body is a Local Authority.

5.—(*a*) As a rule, the instruction in each Course must be given during not less than 10 morning or afternoon meetings in each week of term, and must cover not less than 30 hours a week in all before the hour of 6 p.m.

(*b*) The arrangement of the school day and the provision for vacations must be approved by the Board as satisfactory.

(*c*) The conduct of the School must be such as to encourage a corporate life, and to afford opportunities for reasonable recreation, including, wherever possible, organised games.

6.—(*a*) No pupil may attend any secular instruction not forming part of the curriculum of the School, except with the approval of the Board.

(*b*) Arrangements, approved by the Board, must be made for testing the progress of the pupils; but no pupil may be allowed, without the express consent of the Board in advance, to enter for any examination in secular subjects other than one confined to pupils of the School.

(*c*) Every pupil admitted to the School must take the whole of one of the approved Courses, and no students, not being pupils of the School, may be instructed with the pupils.

(*d*) Pupils on admission must begin with the first year of the Course, except with the express sanction of the Board.

(*e*) The Board may disallow the admission or continued attendance of any pupil who is clearly unfit to proceed with the Course.

(*f*) Recognition may be withdrawn, if a reasonable number of pupils do not, year by year, remain to the end of the Course.

(*g*) No pupil may be admitted unless a certificate is given by his parent or guardian that he is intended to enter into employment for which the School provides a preparation. A record of the occupations actually followed by pupils leaving the School must be kept. A School will not continue to be recognised unless, as a rule, the pupils enter into employment for which the School provides a preparation.

(*h*) No pupil may be refused admission on other than reasonable grounds.

7. It is not desirable that the number of pupils in a Class under the supervision of a single teacher should exceed 32 for ordinary class-work, or 24 for work in which individual attention from the teacher is required, unless the teacher in charge of the class is provided with an assistant. The Board may, if they think fit, definitely require these limits not to be exceeded as regards any Class.

8. Educational responsibility for the School and financial responsibility for its maintenance, in so far as its expenses are not met out of grants and fees, must be undertaken by the same Responsible Body, which must be either a Local Authority exercising powers under Part II. of the Education Act, 1902, or a Joint Body formed by Local Authorities exercising such powers, or the Governing Body of a Charitable Foundation.

9.—(*a*) The School must be managed under and in accordance with a scheme or minute or body of written regulations which determines the constitution of any Governing or Advisory Body established for the School and defines the functions of any such Body and of the Head Master or Mistress of the School, and the Principal of any institution of which the School forms part, both as regards responsibility for general control and as regards immediate responsibility for the details of organisation, discipline, and teaching. The instrument of government must be approved by the Board, with whom a copy thereof as approved must be deposited, and its provisions must not be varied or departed from without the approval of the Board.

(*b*) The instrument of government should provide, whenever possible, for the appointment of an Advisory Body containing representatives of employers and

employees connected with occupations for which the School furnishes a preparation.

10.—(*a*) The School must be conducted with the aid of an adequate and efficient teaching staff under a Head Master or Head Mistress, who may be a Head of Department, if the School forms part of a larger institution.

(*b*) A reasonable proportion of the members of the teaching staff must have had practical trade experience of the occupations for which the School furnishes a preparation.

(*c*) The teaching staff may not undertake any other duties which, in the opinion of the Responsible Body or of the Board, would interfere with the efficient discharge of their duties in the School. Its members should as a rule be solely employed in teaching, and should not be so employed for more than the equivalent of two morning, afternoon, or evening meetings in any one day, or of ten meetings in any week.

11.—(*a*) The premises must be sanitary, convenient for teaching purposes, reasonably quiet, and provided with adequate equipment and appliances for the approved curriculum of the School.

(*b*) Suitable facilities must be provided for recreation, physical exercises, and, wherever possible, organised games.

(*c*) If the School is held in the same building with any other day school or class, the teaching rooms assigned to it, with the exception of rooms which are specially equipped for instruction of a practical kind, must be separate. No room for practical instruction may be used in common by the pupils with those of any other school or class at the same time, unless special permission has been obtained in advance from the Board of Education.

(*d*) It is desirable that each Class in the School should have a room definitely assigned to it for all ordinary purposes.

(*e*) The plans of both site and buildings for new Schools, or for the enlargement of existing Schools, must be drawn in accordance with the Board's requirements, and must be submitted to the Board for approval. Such plans of existing buildings must be submitted as the Board may require in each case.

12.—(*a*) No aid will be given under these Regulations in respect of instruction in religious subjects.

(*b*) A pupil shall not be required, as a condition of being admitted to or remaining in a School recognised under these Regulations, to attend or abstain from attending any Sunday school, place of religious worship, religious observances, or instruction in religious subjects in the School or elsewhere; and the times for religious worship or for any lesson on a religious subject shall be conveniently arranged for the purpose of allowing the withdrawal of any such pupil therefrom.

13. The School must not be conducted for private profit, or farmed out to any member or members of the teaching staff, and must be eligible from its character and financial position to receive aid from public funds.

14. The School may be with or without fees, but any scale of fees must be approved by the Board.

15.—(*a*) Application to the Board for placing a School on the list of Schools recognised for Grants under these Regulations must be made by the Responsible Body on a form of Preliminary Statement which will be supplied by the Board, and should be made as early as possible before the beginning of the first school year for which recognition is sought.

(*b*) The Board before granting the application will have regard to the suitability of the education to be provided by the School in view of the circumstances of the locality and the occupations for which it is intended to give a preparation, and to the relation of the School to other Schools and places of education available for the area; and where the Local Education Authority is not the Responsible Body, will consult the Local Education Authority.

(*c*) A Residential School will not, as a rule, be recognised unless it is recommended to the Board by the Local Education Authority as forming part of the public system of education for the area in which it is situated, and the Board are satisfied that the nature of the instruction provided entails residential conditions.

(*d*) Recognition, when given, will ordinarily be continued from year to year without a further application, but may be withdrawn at any time by the Board.

(*e*) The school year will be held to begin on the 1st of August, unless some other date for an educational year has been fixed for the neighbouring Elementary Schools as a whole, or is specially approved by the Board.

(*f*) In special circumstances recognition may be given for an initial period of one or two terms, and a proportionate grant paid.

16. A full statement of the organisation and curriculum of the School must be submitted for the approval of the Board. When approval has once been given, the statement need not again be submitted so long as no alteration is required by the Board or desired by the Responsible Body.

17.—(*a*) Detailed time-tables of the work of the School must be forwarded in duplicate to the Board at the beginning of each school year. Instruction must be given in accordance with the approved time-table.

(*b*) Notice must be sent to the Inspector, as soon as is possible in each case, of every date on which the School will be closed or its ordinary work suspended.

(*c*) Cases of closure under order of a medical or sanitary authority, or for other unavoidable cause, must be notified to the Board, and due consideration will be given to these in determining whether the Regulations have been satisfied, and in the award of Grant.

18. A full account of the income and expenditure of the School must be furnished annually in such form as the Board may require. Except with the express approval of the Board in advance, all accounts must be made up to 31st March in each year.

19.—(*a*) The School, including the residential arrangements, if any, must be open at all reasonable times to inspection by the Board.

(*b*) All registers and other records prescribed by the Board must be regularly kept, and if required by the Board, through their Inspector or otherwise, must be submitted for inspection forthwith.

(*c*) All returns called for by the Board must be duly made.

(*d*) A copy of these Regulations, available for reference, must be kept at the School.

FOR OFFICIAL USE.

BOARD OF EDUCATION.

INTERIM REGULATIONS FOR SCHOLARSHIPS, EXHIBITIONS, FREE STUDENTSHIPS AND OTHER AWARDS IN ART, APPLICABLE TO THE YEAR 1914.

LONDON:
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1913.

Price One Penny.

PREFATORY NOTE.

The Board of Education intend to formulate with the assistance of the Standing Committee of Advice for Education in Art a revised scheme of awards in Art adapted to the new system of Examinations in Art which became operative in 1913. Pending the completion of this scheme, it is necessary to make provision for the continuance of the awards of Royal Exhibitions, National Scholarships, Free Studentships, and Local Scholarships, with only such changes in the existing conditions as are necessary in order to enable the competitions to be held on the basis of the Examinations available in 1914. The present Regulations which follow without substantial alteration the Interim Regulations for 1913, are intended to effect this temporary object, and will not necessarily be operative after 1914.

The conditions of award of Local Exhibitions in Art will in 1914, as heretofore, be determined by the Local Education Authority or other Managers of the local fund, subject to the approval of the Board. The Board desire, however, to give notice that new Exhibitions of this type awarded after 1914 may not be eligible for aid from them, unless provision is made for this kind of award in the scheme now under consideration.

L. A. Selby-Bigge

September 18th, 1913.

BOARD OF EDUCATION.

Interim Regulations for Scholarships, Exhibitions, Free Studentships and other Awards in Art, applicable to the Year 1914.

NOTE.—*New or substantially altered passages are indicated in italics.*

CHAPTER I.

ROYAL EXHIBITIONS, NATIONAL SCHOLARSHIPS, FREE STUDENTSHIPS AND LOCAL SCHOLARSHIPS, 1914.

Number and Nature of Awards.

1. The Board propose, if there are candidates of sufficient merit, to make the following awards in Art in the year 1914:—

(*a*) 10 Royal Exhibitions, 6 National Scholarships, and not less than 15 Free Studentships, tenable at the Royal College of Art;

(*b*) 24 Local Scholarships tenable at Schools of Art recognised by the Board.

2. A Royal Exhibition entitles the holder to an allowance of 60*l*. a year for three years and to free admission to lectures and instruction in the Royal College of Art approved for the Exhibitioner.

3. A National Scholarship entitles the holder to an allowance of 60*l*. a year for three years and to free admission to lectures and one or more of the technical classes and instruction in one of the Schools of the Royal College of Art, *i.e.*, (1) Architecture, (2) Ornament and Design, (3) Decorative Painting, (4) Sculpture and Modelling, with such other supplementary instruction as may be approved for the Scholar.

4. A Free Studentship entitles the holder to free admission for two years to the lectures and instruction in one of the Schools of the Royal College of Art; *i.e.*, (1) Architecture, (2) Ornament and Design, (3) Decorative Painting, (4) Sculpture and Modelling, with such other

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supplementary instruction as may be approved for the Student.

5. A Royal Exhibitioner or a National Scholar is allowed railway fare (third class) between his home and London for one journey to and fro each session. Railway fare (third class) is allowed by the Board for one journey to London to a Free Student upon taking up his Free Studentship.

6.—(*a*) A Local Scholarship is tenable for three years, with an allowance of 20*l*. a year, at any School of Art recognised by the Board, subject to the following conditions:—

(i) That the fees for instruction will be remitted to the holder of a Local Scholarship;

(ii) That, except in so far as for any limited period his instruction in the School is, with the approval of the Board, replaced for the purposes of this Article by training given elsewhere, the Local Scholar will be under instruction at the School of Art throughout the School year for 30 hours each week, of which 18 must be in the day time, at times when the School is open for instruction in accordance with the time-tables approved by the Board.

(*b*) The Scholarship begins on the date at which the School where it is tenable re-opens after the summer vacation each year.

(*c*) The allowance will be paid in four equal instalments due on the following dates—December 30, February 28, May 31, and on the date on which the School closes for the session. Payment will be made on the receipt of a certificate from the Head Master and Correspondent of the School of Art that the Scholar has attended regularly and pursued his studies satisfactorily.

General Conditions.

7. Royal Exhibitions, National Scholarships, Local Scholarships, and Free Studentships are open only to British subjects, and the Board may refuse to award them to persons whose financial circumstances do not warrant such aid. No two of these awards may be held concurrently, nor may one of them be held concurrently with

a Local Art Exhibition; but, subject to the sanction of the Board, any of these awards may be held concurrently with other Scholarships or aid granted by Local Authorities.

8. In the event of any revision of these Regulations candidates who have obtained any one of these awards will hold the award until its expiration under the Regulations in force during the year in which the award was made.

9. A candidate who has held a Royal Exhibition, a National Scholarship, or a Free Studentship is ineligible to compete again for any award under this Chapter.

10. A candidate who has held a Local Scholarship is ineligible to compete again for a similar award.

11. No person will be accepted as a candidate for a National Scholarship who is not a registered Art student and whose ordinary employment for a reasonable time immediately prior to his application for admission to the competition has not been in a trade which depends upon Decorative Art.

12. The tenure of a Royal Exhibition, National Scholarship or Free Studentship is subject to compliance with the regulations of the Royal College of Art, and to the satisfactory progress of the holder in the approved course of study.

Determination of the Awards.

13. These awards will be made upon the results of the Board's Examinations in Drawing, Painting, Modelling, Pictorial Design, and Industrial Design, or, in the case of candidates in Architecture, upon those of the Intermediate Examination of the Royal Institute of British Architects, to be held in June 1914.

14. Candidates, if eligible to take the examination,* may present themselves for examination either in Drawing, or in Painting, or in Modelling, or in Pictorial Design, or in Industrial Design, or in Architecture, and at least one Royal Exhibition, one National Scholarship, one Free Studentship, and one Local Scholarship will, provided that there are candidates of sufficient merit, be awarded in each of these six subjects, *but no candidate in Drawing will be regarded as of sufficient merit for the award of a*

* For the conditions governing the admission of candidates to the Board's Art Examinations, *see* Rules 110 (Regulations for Examinations in Art, 1914).

Royal Exhibition or National Scholarship who has not reached a high standard of attainment and shown special promise. The remaining Awards will be allocated by the Board to the several Examinations, after considering the number, as well as the merit, of the candidates taking each Examination, and with a bias, in the case of the Local Scholarships, in favour of candidates taking the Examination in Drawing, and in the case of Free Studentships, in favour of candidates taking the Examination in Industrial Design. Candidates in Architecture must take Architectural Design as their optional subject in the Intermediate Examination of the Royal Institute.

Candidates proposing to compete at the Board's Art Examinations for one of the above Awards must apply for admission to the Examination upon the prescribed Form, which should be duly completed and returned to the Board not later than the 1st March, accompanied by the prescribed fee of 10s. This fee must also be paid to the Board of Education by candidates taking the Intermediate Examination of the Royal Institute of British Architects solely for the purpose of competing for one of the Board's Awards. Candidates taking the Intermediate Examination of the Royal Institute, partly for the purpose of competing for one of the Board's Awards, and partly for the purpose of professional registration, will pay to the Institute such fees as may be required by the Institute.

CHAPTER II.

Local Exhibitions in Art.

15. Where a Local Education Authority or other persons (in this Chapter referred to as the Managers of the local fund) contribute a sum of not less than 25*l.* per annum towards an approved Local Art Exhibition, the Board may contribute towards the Exhibition subject to the conditions stated in this Chapter. The Board's contribution will not exceed 25*l.* per annum in respect of any one exhibitioner, nor will it be such as to make the total amount of the Exhibition exceed the sum recognised by the Board as reasonably paid by the Managers of the local fund in respect of the exhibitioner's maintenance allowance and fees or other payments for his instruction.

16. The local contribution may be made from a rate levied under Part II. of the Education Act, 1902, or from subscriptions of living persons raised for this definite purpose. Endowments or moneys held in trust, unless subscribed for this definite purpose by the donor during his lifetime, or funds derived from the residue under the Local Taxation (Customs and Excise) Act, 1890, or other mere surplus funds, will not be regarded as local contributions for the purpose of this Chapter.

17. The conditions of award of the Exhibition may be determined by the Managers of the local fund with the approval of the Board, but must always include provision for the award to be made on the results of a competition held either in connection with the Board's annual Examinations in Art or according to some other method approved by the Board. The Exhibition may not be held concurrently with any other of the Board's awards in Art. The Board may refuse to contribute towards any Exhibition for which there is not a sufficient number of candidates, or to approve the award to a candidate who is insufficiently advanced or whose financial circumstances do not appear to warrant such aid.

18. No award will, as a rule, be approved by the Board unless the candidate has reached a standard comparable with that required for the award of a Royal Exhibition or a National Scholarship.

19. The place or places where the Exhibition is to be tenable, and where the exhibitioner is to pursue his studies, may be fixed by the Managers of the local fund, subject to the following conditions:—

(*a*) The exhibitioner must attend some course of Art instruction of an advanced character at a college or other institution at which such a course is provided for the students ordinarily in attendance at the institution as well as for exhibitioners under this Chapter. The course proposed to be taken by the exhibitioner must be approved by the Board, and it must as a rule be one of the courses so provided.

(*b*) The exhibitioner must have the option of holding his Exhibition at the Royal College of Art subject to compliance with the regulations of that institution. If the exhibitioner exercises this option, the fees for instruction will be remitted.

(*c*) If the exhibitioner attends a college or other institution aided or maintained by the Managers of the local fund, the Board may require that the fees or ordinary payments in respect of the instruction shall be wholly or partially remitted.

(*d*) The exhibitioner's whole time must be devoted to instruction in the approved course.

20. The Board may require a report on the progress of the exhibitioner to be made by one of their officers deputed for this purpose.

21. The Board's contribution will not be payable till the Managers of the local fund have disbursed to or on behalf of the exhibitioner the full amount of the Exhibition, including the amount of the Board's grant. Before paying their contribution the Board will require (i) a satisfactory certificate from the Principal of the institution at which the Exhibition is held as to the progress of the exhibitioner; (ii) evidence from the institution of the receipt by them of the exhibitioner's fees or other payments for instruction, *if they have not been remitted;* and (iii) a receipt from the exhibitioner for the amount of his maintenance allowance.

22. Particulars of any Exhibition to which it is desired that the Board should contribute under this Chapter must be returned on the prescribed form in time to admit of their proper consideration by the Board, and their due advertisement in the locality, and in any case not later than the *1st March 1914. It should also be noted that applications by candidates for admission to the Board's Art Examinations must be submitted to the Board on the prescribed Form not later than the 1st March.* The names of the candidates to whom it is proposed that Exhibitions should be awarded, and of the institutions where they will pursue their studies, *and a statement of the nature of the Courses to be taken*, must be furnished to the Board on the prescribed form before the 1st September 1914.

23. Applications for the renewal of Exhibitions for a second or third year must be made on the prescribed form not later than the 1st September.

CHAPTER III.

OTHER AWARDS.

Princess of Wales' Scholarships.

24. Two Princess of Wales' Scholarships, of about the value of 25*l.* and 11*l.* respectively, are open to competition each year and are offered to the two women students of the Schools of Art who are granted the highest prizes of the year in the National Competition. These Scholarships, which are intended to enable students to continue their regular course of instruction in a School of Art, *are tenable during the School Year next following that in which the Competition on which they were awarded took place, and must be held in the School or Schools of Art which the students were attending during the Session in which they gained the Scholarships.* The Scholarships are not awarded to the same persons for more than three years in succession.

25. Each "Princess of Wales' Scholar" is required to present half-yearly reports, showing the course of study she has pursued at her School of Art during her tenure of the Scholarship and her attendances thereat. These reports must be sent to the Board, through the Correspondent of the School of Art in which the Scholar is studying, on the 31st of March and *31st* of *July*. A moiety of the sum awarded will be paid on the receipt of each report if it be satisfactory.

Short Courses of Instruction in Art.

26. Short Courses of Instruction in Art are given at the Royal College of Art during July and August for a limited number of Art Teachers and Advanced Art Students whose preliminary training enables them to profit by the instruction.

27. A selected candidate will have third-class railway fare for one journey from his home to London at the beginning, and for one journey to his home at the end of the Course; also a grant of 1*l.* a week towards his expenses while attending the Course. In the case of Teachers resident in London or in its vicinity a reduction is made in the grant.

Information as to the precise period of these Courses and Forms of Application for admission are circulated about April.

Visits to Museums and Centres of Art Instruction.

28. Grants will be made to enable a limited number of teachers and students of Schools of Art and Art Classes (*a*) to see the works in the National Competition exhibited at South Kensington, to visit and study in the Victoria and Albert Museum, the Royal College of Art, and other Institutions; and (*b*) in special cases, to visit Foreign Towns, Schools, Galleries, and any approved centre of Art instruction, for the purposes of studying and making sketches of buildings and of objects. Teachers or students to whom such grants are made may be required on any of the above occasions (*a*) and (*b*) to do special work for the Board.

Application must be made on the prescribed Form not later than the *15th* June.

Provided that a satisfactory report, together with sketches, drawings, or other work, be submitted:—

(*a*) Applicants who are selected to see the works in the National Competition, or to visit and study in the United Kingdom, will be allowed third-class railway fare and not more than 7*s*. 6*d*. a day towards their expenses;

(*b*) Applicants selected to visit and study in Foreign Towns will be allowed second-class railway fares while travelling abroad, and second-class boat fare, and not more than 10*s*. a day towards their expenses.

No cab or omnibus fares will be allowed.

Teachers and students crossing from Ireland will be allowed first-class steamboat fare.

For Official Use. Rules 109.

BOARD OF EDUCATION.

RULES as to the issue of

(I.) CERTIFICATES FOR TEACHERS OF ART under the provisions of Circular 786; and

(II.) ART CLASS TEACHER'S CERTIFICATES AND ART MASTER'S CERTIFICATES under the expiring Regulations.

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The following rules continue in Part I., with slight modifications, those published in 1912, in amplification and explanation of Appendix B. of Circular 786, in which the Board's requirements as to the qualifications of candidates for the Teaching Certificate for Teachers of Art were set out. The possession of the Teaching Certificate will be regarded by the Board as qualifying the holder for the Head Mastership of a School of Art.

New or substantially modified passages are printed in italics.

L. A. Selby-Bigge

13*th October* 1913.

I.—RULES AS TO THE ISSUE OF CERTIFICATES FOR TEACHERS OF ART UNDER THE PROVISIONS OF CIRCULAR 786.

1. Candidates must have passed the Board's Examination in Drawing, and either

(*a*) the Board's Examination in Painting or Modelling or Pictorial Design, or Industrial Design; or

(*b*) the Final Examination of the Royal Institute of British Architects in Architecture;

but for the present the Board will accept in lieu of a pass in Drawing the Art Class Teacher's Certificate together with First Class successes in Drawing from the Antique and Drawing from Life obtained in 1912 or previous years *or at the special Examinations to be held in February*, 1914, *under paragraph* 3 *of Part* II. *of these Rules*.

2.—(*a*) A candidate must also have passed the Board's Preliminary Examination for the Elementary School Teacher's Certificate or some other Examination indicating the satisfactory completion of a preliminary general education, or must have submitted other evidence of having received such education.

A list of other Examinations which the Board are prepared to accept is given in Appendix A.

(*b*) In the case of a student who has not passed an accepted examination, but who has been educated at a Secondary School on the list of Secondary Schools recognised by the Board as Efficient, and had left that school before July 31st, 1912, the Board would be prepared to receive a statement from the Head

Master or Head Mistress of the school in evidence that he has satisfactorily completed a preliminary general education. Any such statement should, amongst other things, show during what years the candidate was in the school, what Form he was in at leaving, what his age was at leaving, and what test (if any) of general education he passed, and at what age.

(*c*) *Where a candidate had completed his general education before* 31 *July* 1912, *and the Board are of opinion that on account of his age or other sufficient reason an examination test is unsuitable, and such a statement as mentioned above is not forthcoming, they will for the present be prepared to accept as evidence of sufficient general education any of the following certificates of attendance at University Extension Courses:—the Certificate of the Vice-Chancellor of Cambridge University for Systematic Study; the Certificate of the Vice-Chancellor of London University for Continuous Study; or the Affiliation Certificate of Oxford University.*

3. A candidate must also be over 19 years of age and have furnished a satisfactory medical certificate in a prescribed form, indicating his fitness for the work of a teacher. An indication of the Board's requirements in regard to the standard of physical fitness which is desirable is contained in Appendix B.

4.—(*a*) During his training a candidate must have completed to the satisfaction of the Board an approved course in the principles and practice of teaching and school management at an institution recognised for the purpose, affording practice, under the supervision of an expert master of method, in the teaching of artistic subjects both to adults and to children, by the methods of collective and individual instruction. It is contemplated that this course should extend throughout a school session in the sense that professional preparation for teaching should be the dominant motive of the student's work during that session, although this should not, of course, prevent him from simultaneously making further progress in his general art studies. It will, however, be open to any recognised institution to propose a course which extends over more than one session, and gives a correspondingly less time in each session to this professional training.

(*b*) Finally, he must have passed at the close of his course of training an Examination in the principles of teaching and school management, with special reference to the relations of art to industry, and to the place of artistic subjects in systems of education, and must have reached a reasonable literary standard in the papers worked at this Examination. Special Examinations for this purpose will be held by the Board. Each candidate will be charged a fee of 3*s.* 6*d.*

(*c*) An indication as to the range of the Board's Examination is given in the Syllabus of that Examination, which is printed as Appendix C.

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5. The Teaching Certificate issued by the Board will set out the qualifying Examinations passed by the candidate, and will specify those (if any) in which he passed with distinction; and a subsequent entry may be made if the candidate passes any further Examinations in Art. The certificate may, if desired, take the form of an endorsement by the Board upon an approved diploma awarded by the institution at which the candidate has been trained.

Appendix A.

List of Examinations.

1. The Higher Certificate Examination of the Oxford and Cambridge Schools Examination Board.

2. The London University Matriculation Examination.

3. The London University Senior School Examination.

4. The Matriculation Examination conducted by the Joint Board of the Universities of Manchester, Liverpool, Leeds, and Sheffield.

5. The Senior School Certificate Examination of the Joint Matriculation Board of the Universities of Manchester, Liverpool, Leeds, and Sheffield.

6. The Birmingham University Matriculation Examination, or the Examination for such Senior School Certificates as exempt the holders from the Matriculation Examination.

7. The University of Wales Matriculation Examination.

8. The Durham University Matriculation Examination.

9. The Bristol University Matriculation Examination.

10. The Oxford University Higher Local Examination.

11. The Cambridge University Higher Local Examination.

12. The Oxford University Local Examination for Senior Students.

13. The Cambridge University Local Examination for Senior Students.

14. The College of Preceptors Examination for the Diploma of Associate.

15. The First Class Certificate of the College of Preceptors.

16. The Senior Certificate Examination of the Central Welsh Board.

17. In the case of candidates from Scotland the Board will be prepared also to accept:—

(*a*) The Preliminary Examination of the Joint Board of Scottish Universities;

(*b*) The Leaving Certificate Examination of the Scotch Education Department.

(*c*) The King's Scholarship Examination of the Scotch Education Department.

(*d*) The L.L.A. Examination of the University of St. Andrews.

18. In the case of candidates from Ireland the Board will be prepared also to accept:—

(*a*) The Matriculation Examinations of the University of Dublin, the National University of Ireland, and the Queen's University of Belfast;

(*b*) The Senior Grade Examination of the Irish Intermediate Education Board.

Appendix B.

Medical Examination of Candidates for Teaching Certificates for Teachers of Art.

1. It will be a condition of the issue of a Teaching Certificate in Art that the candidate should have furnished a medical certificate in a prescribed form indicating his fitness for the work of a teacher, and that the Board should be able to regard the certificate as satisfactory.

2. The Board contemplate that candidates will, as a rule, submit themselves to a medical examination for this purpose at the time of their entry on the course of pedagogic training, which will, it is anticipated, normally follow the completion of their technical qualifications by passing Art and other Examinations.

3. Candidates will be required to submit themselves to one of the Medical Officers nominated by the Board of Education for the purposes of the Elementary School Teachers (Superannuation) Act, 1898, for the medical examination prescribed by the Board. This will be of the same character as that required in the case of candidates for the Elementary School Teacher's Certificate, but in considering the report of the Medical Officer, the Board will have regard to considerations specially affecting teachers in Schools of Art, and will act upon the principles set out in the paragraphs 4—7 below.

A list of the Medical Officers, which contains the names of some Women Doctors, will be sent on application. The fee for the Examination, which is 10*s.* 6*d.*, must be paid by the candidate.

4. Any candidate who is suffering from a disease of a character which would render him a danger to the health of the students under his instruction will be ineligible for recognition.

5. The Board will also be unable to recognise candidates who, though in good bodily health, suffer from physical defects, especially of vision, hearing, or speech, in such a degree as to make them incapable of being efficient teachers. But if such defects are capable of remedial treatment, the Board will be prepared to reconsider the question of recognition when treatment has been obtained.

6. The medical report upon a candidate may indicate that his health is already affected temporarily, or may in the near future be so affected, by conditions which can be ameliorated, but are likely to lead, in the absence of remedial treatment, to permanent injury to health and to loss of efficiency. In such cases, the Board may have to consider whether it shall not be a condition of their recognition (if given) that the candidate shall submit himself to treatment at an early opportunity.

7. The Board do not contemplate at present refusing recognition in the case of a candidate merely because he is not likely to be able to give a full term of active service, provided that he is clearly suitable in other respects and can reasonably be expected to render effective service for a substantial period.

It should, however, be borne in mind that in the event of a superannuation scheme being brought into force for teachers in Schools of Art, it may be found necessary to impose stricter tests of health for teachers to whom the scheme is applicable.

8. If an intending candidate has had a serious illness before, or in the course of, the preliminary stage of his preparation, the Managers should consider the advisability of urging him, or his parents, to ascertain whether the illness may have affected his suitability for the work of a teacher. This is especially important in the case of such an illness as rheumatic fever, or one of the forms of tuberculous disease.

Appendix C.

Syllabus for the Board's Examination in the Principles of Teaching and School Management with Special Reference to Art.

(i) The mind of the student and how to train it.

(ii) The relation of art to the life of the individual and the community, in the past, the present, and the future, and its place in educational systems.

(iii) The relation of art to industry.

(iv) The methods of teaching drawing and art in Elementary Schools, Trade Schools, Secondary Schools, and Schools of Art.

(v) The organisation and equipment of Schools of Art.

II.—RULES AS TO THE ISSUE OF ART CLASS TEACHER'S CERTIFICATES AND ART MASTER'S CERTIFICATES UNDER THE EXPIRING REGULATIONS.

1. *In accordance with Circular* 775, *the ordinary series of Examination tests for the Art Class Teacher's and Art Master's Certificates was brought to an end in* 1912. *The Board have, however, decided, as already made known in Circular* 814, *to give a further opportunity to candidates who might, when the withdrawal of the tests was announced, have reasonably expected to complete the qualification for these Certificates. The following detailed arrangements have been made as to Examination successes and the submission of works.*

2. *An opportunity will be offered at the end of November,* 1913, *for candidates who comply with the requirements indicated in paragraph* 4 *below to submit all the remaining works in the prescribed subjects, the acceptance of which is still required for the Art Class Teacher's and Art Master's Certificates.*

3. *In February,* 1914, *a special series of examinations will, so far as is necessary, be held at various local centres in the several subjects in which candidates for the Art Class Teacher's Certificate and Art Master's Certificates were required to be examined. Only those candidates who comply with the conditions indicated in paragraph* 5 *below will be admitted to these examinations. Applications to attend these examinations should be sent on the prescribed form through the authorities of the school at which the candidate is under instruction. If a candidate is not under instruction at a school, he must apply direct to the Board.*

4. *Only candidates attempting to qualify for the Art Class Teacher's Certificate or for the Art Master's Certificates will be entitled to submit works for examination in November,* 1913; *and such candidates will only be eligible to submit works, provided that they*

(i) *undertake to submit then all the works, the acceptance of which is required to satisfy the works requirement for the Certificate for which they are attempting to qualify; and*

(ii) *if they have not already satisfied the requirements in respect of examinations, declare their intention, in the event of all the necessary works submitted by them being accepted and the works requirement for the Certificate being accordingly satisfied, to attend the special*

examinations in February, 1914, in all the subjects the prescribed successes in which are still required to complete the qualifications for the Art Class Teacher's Certificate or one of the Art Master's Certificates as the case may be.

5. *The persons to whom admission to the special examinations to be held in February, 1914, will be restricted, and the purposes for which they will be admitted, are as follows :—*

(a) *Candidates for the Art Class Teacher's Certificate or Art Master's Certificates who have secured the acceptance of works executed in all the prescribed subjects, and undertake to attend all the examinations required for the completion of their qualification, will be admitted to such of the examinations as are required by them for this purpose.*

(b) *Candidates coming under (a) and also persons who already hold the Art Class Teacher's Certificate will be admitted to the examinations in Drawing from Life and Drawing from the Antique, if they desire to obtain First Class successes in these subjects for the purpose of qualifying for exemption from the Board's Examination in Drawing under paragraph 1 of Part I. of these Rules, but it must be noted that in the case of a candidate under (a) these successes will only entitle him to such exemption, if he also obtains the Art Class Teacher's Certificate.*

6. *Candidates who have secured the acceptance of all the prescribed works and have obtained the necessary examination successes will receive the Art Class Teacher's Certificate or the Art Master's Certificate, as the case may be.*

7. *The examination successes required are indicated in the following paragraphs :—*

(a) *A candidate for the Art Class Teacher's Certificate will be accepted as satisfying the requirements in respect of examinations provided that he has obtained First Class successes in four of the subjects, and Second Class successes in the remaining two subjects prescribed by the expiring Syllabus as shown in Appendix D. of these Rules.*

(b) *A candidate for the Art Master's Certificate, Group I., will be accepted as satisfying the requirements in respect of examinations provided that he has obtained First Class successes in six of the subjects, and Second Class successes in the remaining two subjects prescribed in the expiring Syllabus as shown in Appendix D. of these Rules.*

(c) *A candidate for the Art Master's Certificate in other Groups must have satisfied the requirements prescribed*

for Groups II., III., or IV., in the expiring Syllabus as shown in Appendix D. of these Rules, or, if he has obtained successes under old conditions for Certificates Groups II. to VI., the requirements prescribed for those Certificates by the Directory of 1900.

8. *Works must be submitted, packed, and forwarded, in accordance with the Rules set out in Appendix E.*

Appendix D.

For the ART CLASS TEACHER'S CERTIFICATE the requirements are :—

The satisfactory execution of the following works* :—

(*a*) Subject 1*a*. Six or eight geometrical problems worked in ink with instruments, the problems being stated in writing. (On one imperial sheet.)

(*b*) Subject 5*a*. A drawing from a group of models, which should include vases such as those produced by Wedgwood or Minton, placed upon a drawing board, or from a group of two or three objects such as a basin, a chair, a hat, a wheel-barrow. The group must be drawn without background, and intelligently, but not elaborately, shaded in chalk, pencil, or sepia. (On one imperial sheet.)

It must be distinctly understood that this work must be entirely executed from the models and objects, without reference to drawings, paintings, or any flat representation of the same subjects.

(*c*) Subject 5*b*. A shaded drawing in chalk or pencil from a piece of ornament in relief, or from casts of fruit. (On one imperial sheet.) Drawings from casts in relief of the same size as the originals may not be submitted for examination.

It must be distinctly understood that this work must be entirely executed from the cast without reference to drawings, paintings, or any flat representation of the same subject.

(*d*) Subject 10. Three studies of plant-form, each study from a different type of freely-growing plant, rendered by the candidate with pencil, chalk, pen, or brush, with the particular view of accurately representing the growth, structure, and character of the plants chosen. (On one imperial sheet.) So much of the plant selected for each study should be drawn as will fully show its growth; mere bunches of flowers should not be selected.

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* For the subject-numbers set out on pages 9 to 15, reference should be made to the note on page 16.

Silhouette treatments (dark upon light, or light upon dark) are admissible, conditionally on the above object (underlined) being kept strictly in view. Pictorial renderings or highly shaded drawings are not desirable.

(*e*) Subjects 14 and 22. A study, in colour, of a growing plant from nature, not pictorially represented (*i.e.*, with accidents of light and shade), but simply and directly drawn, with details (separately if desired), selected by the student as being characteristic of its growth and suggestive of ornament, together with three designs in which the foliage and other details of the plant are ornamentally treated and arranged to occupy, in a decorative way, a square, a circle, and an oblong. One of the designs must be in monochrome, one in two colours, and one in polychrome. Of these at least one must be executed in body colour or tempera. In each case the plant must be not merely composed into the given space, but treated in accordance with decorative conditions. White, whether left or applied, will be counted as a colour; and the ground colour will be considered as part of the scheme. (On one imperial sheet.)

N.B.—Plain lettering, of good form, must always be used by Candidates for the titles and descriptions placed by them on their Certificate Works.

and a *First Class at the Board's Examinations in:—

(*f*) Geometrical Drawing (Art);

(*g*) Perspective;

(*h*) Memory Drawing of Plant Form;

(*i*) Model Drawing;

(*j*) Drawing in Light and Shade from a Cast;

(*k*) Design, Stage 1, or any higher success.

Art Master's Certificates.

The Certificate, Group I., will be granted to Candidates who have obtained the Art Class Teacher's Certificate, and have submitted satisfactory specimens of the following works:—

(*a*) Subject 1*c*. One Perspective problem stated in words and clearly worked in ink, to fill an imperial sheet.

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* *This requirement as to Examination Successes has been modified as shown in* 7 (*a*) *on page* 8, *but the requirement as modified must have been satisfied in February*, 1914, *at the latest.*

(*b*) Subject 1*d*. Geometric elevations of the Doric, Ionic, and Corinthian orders, with their entablatures complete, the columns to be 12 inches high, including capital and base. (On one imperial sheet.)

(*c*) Subject 8*b*[2]. A shaded drawing of a complete human figure from the Antique. (On one imperial sheet.)

It must be distinctly understood that this work must be entirely executed from the cast without reference to drawings, paintings, or any flat representation of the same subject.

(*d*) Subject 8*c*[1]. Shaded drawings of a head, hand, and foot from the Life, full size, thoroughly carried out in pencil, chalk, or brush in monochrome.

(*e*) Subject 22*b*. A design in outline, to be executed in some historic style of ornament. The style and period must be stated, and the ground must be tinted. The outline, which should be part of the design, may be executed with a broad pen or a brush. (On one imperial sheet.)

(*f*) Subject 22*e*. A sheet of Roman letters designed to fill an oblong and a triangle. The students should take sentences from some well-known author.

(*g*) Subject 23*a*. A geometrical drawing in pencil made from measurements taken by the student from an actual piece of architecture, which might be either part of a building or a tomb with canopy, or a public monument, or a church porch, or cathedral stalls, or some other object of that kind. (On one imperial sheet.) The measurements and sketches must be firmly fastened to this sheet, to which must be attached also, on a half imperial sheet, freehand sketches slightly shaded in pencil, pen, or brush-work, of some ornamental detail in the object chosen for measurement.

(*h*) Subject 23*c*. A drawing of a flowering plant (such as that drawn in (*e*) for the Art Class Teacher's Certificate), with three distinctly different designs for patterns based on the plant. Each of these three different designs must be suited to the technical requirements of one of three different processes of manufacture; such, for instance, as embroidery, inlay, printing, wrought metal, weaving, painting, &c. The process and material for which it is intended, must be named on each design. One at least of these designs must be executed in body colour or tempera. (On one imperial sheet.)

(*i*) Subject 23*e*. A modelled study of a flowering plant (such as that required under (*e*) for the Art Class Teacher's Certificate), with three distinctly different modelled designs for patterns based on the plant. Each of these three different designs must be suited to the technical

requirements of one of three different processes of manufacture. The process and material for which it is intended must be named on each design.

N.B.—Plain lettering, of good form, must always be used by Candidates for the titles and descriptions placed by them on their Certificate Works.

and have obtained a *First Class at the Board's Examinations in—

(*j*) Architecture ;
(*k*) Drawing from Life† ;
(*l*) Anatomy ;
(*m*) Painting Ornament ;
(*n*) Principles of Ornament ;
(*o*) Design, Stage 2 ;
(*p*) Modelling the Head from Life ;
(*q*) Modelling Design, Stage 2.

Candidates' successes (First Classes and National Competition Awards) in subjects not included in the foregoing Certificates may, on special application being made, be endorsed on their Art Master's Certificate.

In addition to the Art Master's Certificate (Group I.) the following Certificates for different groups of subjects of instruction in Art will also be granted to Candidates who pass the prescribed Examinations :—

Certificate for Group II. (Architecture, Design, and Applied Art.)

This Certificate will be granted to Candidates who have obtained the Art Master's Certificate (Group I.), and have submitted satisfactory specimens of the following works :—

(*a*) Subject 22*a*. A set of studies of fruit, foliage, or freely growing plants from nature, and of animals, birds, &c., from nature or museum specimens, to be treated from the decorative and constructive point of view, both as regards form and colour.

These studies may be executed in any appropriate method, and must be submitted on not more than two imperial sheets.

It must be distinctly understood that this work must be entirely executed from the plants or animals, without reference to drawings, paintings, or any flat representation of the subject.

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* *This requirement as to Examination Successes has been modified as shown in* 7 (*b*) *on page* 8, *but the requirement as modified must have been satisfied in February*, 1914, *at the latest.*

† Where it is proved to the satisfaction of the Board that a Life Model cannot be obtained for this Examination, Drawing from a complete full-size Antique figure will be accepted instead.

(*b*) Subject 22*d*. A set of studies of ornamental and figure composition from coloured or modelled objects in museums and elsewhere.

These studies should not be highly finished specimens of Still Life painting, but should be made with a view to expressing the treatment and showing the main lines and disposition of the masses of form and colour.

When possible, the relation of the composition or decoration to its immediate surroundings should be shown, and in the case of studies from modelled work, sectional drawings of mouldings, &c., should be given.

The date, style, and origin of each example should, as far as possible, be stated under the sketch.

These studies must be submitted on not more than two imperial sheets.

(*c*) Subject 23*d* (1). A design drawn, painted, or modelled, of ornament and human figures, as applied to decorative or industrial Art. The design should be for some well selected and clearly stated purpose or object. It is essential that the human figure should form an important feature of the design, which should not be less than twelve inches in its longest dimension.

(*d*) Subject 23*b*. A design for some important feature of civil or ecclesiastical architecture, such as a doorway, an entrance hall, wall-surface and panelling, rood-screen, pulpit, stalls, tomb, &c. The design must be made with a view to enrichment by carved or painted decoration. The design must be accompanied by plans, elevations, sections, and details of construction, and by a model of a part or whole of the design to scale, and a finished model of part of the ornament. The design must be not less than 24 inches in its longest dimension.

(*e*) Subject 23*c*. A design for some object of utility involving a particular branch of decorative or industrial Art, such as embossed leather work, stencilling, embroidered or appliqué work, weaving, wood or stone carving, wood inlay, pottery, enamelling, or metal work. The object is to be executed in the material by the candidate, and must be submitted together with his original design, and, where they are necessary, working drawings. The human figure may be introduced into the design.

(*f*) Subject 23*d* (2). A composition in colour for a given decorative subject. This work must be executed entirely by the candidate in four days and a certificate to this effect, signed by the Correspondent of the School, must accompany the work.

The subject, with conditions as to size, &c., will be prescribed by the Board upon application from the Correspondent of the School, on behalf of the Candidate, who

must have already obtained the Art Master's Certificate (Group I.). The work must be completed within ten days of the receipt of these instructions:—

and have obtained a *First Class at the Board's Examinations in—

(*g*) Historic Ornament; and

(*h*) Modelling Design, Honours.

CERTIFICATE FOR GROUP III. (Figure Drawing and Painting.)

This Certificate will be granted to Candidates who have obtained the Art Master's Certificate (Group I.), and have submitted satisfactory specimens of the following works:—

(*a*) Subject 8*c*². A finished study in black and white of a complete nude human figure from the Life. The study, which must not be less than 24 inches high, may be executed with charcoal, chalk, or pencil. (On one imperial sheet.)

It must be distinctly understood that this work must be entirely executed from the living model without reference to drawings, paintings, or any flat representation of the subject.

(*b*) Subject 8*e*. A set of not less than six short-time studies of the complete human figure from the Life, executed in black and white. (On one imperial sheet.) The time spent on each study must be stated.

It must be distinctly understood that this work must be entirely executed from the living model without reference to drawings, paintings, or any flat representation of the subject.

(*c*) Subject 8*d*. Two studies of drapery arranged on the living model. The drawing of each figure must be not less than 12 inches in height. The studies must be mounted on one imperial sheet.

It must be distinctly understood that this work must be entirely executed from drapery without reference to drawings, paintings, or any flat representation of the subject.

(*d*) Subject 17*c*. A painting in oil colours of the complete nude human figure from the Life, on a canvas not exceeding 36 inches in its longer dimension.

It must be distinctly understood that this work must be entirely executed from the living model without reference to drawings, paintings, or any flat representation of the subject.

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* *This requirement as to Examination Successes must have been satisfied in February, 1914, at the latest.*

(*e*) Subject 9*a*. Two tinted drawings, one showing the bones and the other the muscles within the outline of a complete figure, drawn from the Life. Each drawing must be on one imperial sheet :—

and have obtained* at the Board's Examinations an Excellent in—

(*f*) Drawing from Life ;

and a First Class in—

(*g*) Drawing the Antique from Memory ;

(*h*) Painting from Still Life.

CERTIFICATE FOR GROUP IV. (Modelling).

This Certificate will be granted to Candidates who have obtained the Art Master's Certificate (Group I.), and have submitted satisfactory specimens of the following works :—

(*a*) Subject 8*e*. A set of not less than six short-time studies of the complete human figure from the Life, executed in black and white. (On one imperial sheet.) The time spent on each study must be stated.

It must be distinctly understood that this work must be entirely executed from the living model without reference to drawings, paintings, or any flat representation of the subject.

N.B.—This work will not be required of a Candidate who has taken the Group III. Certificate, see page 14.

(*b*) Subject 19*e* or 19*b*^{2}. A modelled study in the round, not less than 30 inches high, of a complete human figure from the Life or Antique, cast by the Candidate.

(*c*) Subject 19. A model in relief of a study from a human figure, which may be partially draped, and which has been posed with the intention of filling decoratively some simple geometrical form, such as a square or rectangular panel, lunette, spandril, or roundel, of not less than 24 inches in its longest dimension, including mouldings, which must be given so that the treatment of the relief in relation to them may be shown.

(*d*) Subject 20. A modelled study in relief, not less than 24 inches in its longer dimension, of foliage from nature.

(*e*) Subject 23*f*. A modelled design in relief or in the round of ornament and figures treated decoratively. On the work there must be a statement of the particular purpose and material for which the design is made ;

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* *This requirement as to Examination Successes must have been satisfied in February,* 1914, *at the latest.*

and have obtained* at the Board's Examinations an Excellent in—

(*f*) Drawing from Life;

and a First Class in—

(*g*) Historic Ornament;

(*h*) Modelling from Life; and

(*j*) Modelling Design, Honours.

Note.

A complete list of the numbered sub-divisions of subjects of Art for classifying School work, some of which are mentioned in the requirements as to works set out on pages 9 to 15, is to be found in the Syllabus of the qualifications required for the Art Class Teacher's Certificate and the Art Master's Certificate which was published in 1911, and can be obtained on application to the Board.

Appendix E.

(i) Rules as to Submission of Works for Certificates.

(*a*) Works submitted for the Art Class Teacher's and Art Master's Certificates by registered Art Students must be duly entered on Form 528.T. Cert. and be forwarded to the Board of Education, South Kensington, *by the 30th November 1913.* The form should be forwarded on the same date to the Board of Education, Whitehall.

(*b*) Candidates who are not registered Art Students, must send their Certificate works (carriage prepaid) direct to the Board of Education, South Kensington, London, S.W., *by the 30th November, 1913.* Each such Candidate must fill up a Form 528a.T. Cert., in respect of the works submitted, and forward it on the same date to the Board of Education, Whitehall, London, S.W.

(*c*) Only one work in each Subject, or one set of works (where more than one is required under the regulations to illustrate the Subject) may be submitted by a Candidate for any one Certificate.

(*d*) In addition to the title and description which the Candidate may place on it, every work submitted as a Certificate work must be effectively marked to show, (1) in the case of registered students the number of the School or Class, and

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* *This requirement as to Examination Successes must have been satisfied in February,* 1914, *at the latest.*

the name of the student, and in other cases, the name and address of the Candidate; (2) the title of the Certificate for which the work is submitted. Labels are provided by the Board.

(*e*) It should be specially noted that errors or omissions in complying with these rules may lead to the disqualification of the Certificate work.

(*f*) A work which has been once submitted for Certificate purposes may not be again submitted.

(*g*) Applications will be considered for successes in the National Competition obtained by Students within the last ten years to be counted as equivalent to the acceptance of Certificate works in the same subjects.

(*h*) The latest day for sending up works is the **30th November 1913.**

(ii) Packing and Transmission of Works.

(*a*) The Board do not provide cases for packing the works.

(*b*) The works, after they have been labelled and entered on Form 528. T. Cert. must be packed so that they will not shift, nor rub one over the other, in travelling.

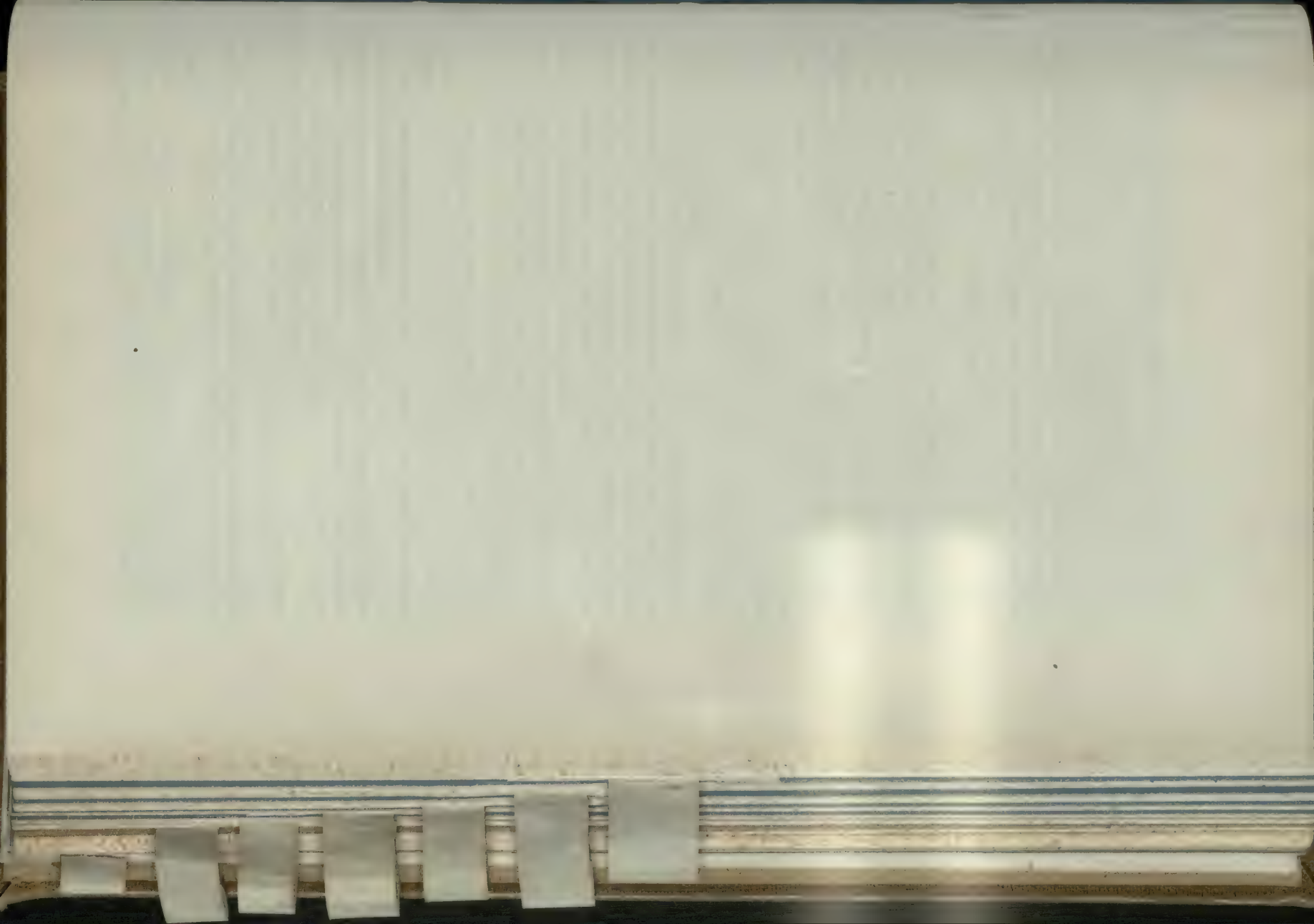
(*c*) Special care must be taken to pack Oil Paintings in cases, and they should be protected by corks fastened at their corners, or by other efficient means, so that no other works may be in contact with their surfaces. No work which is not thoroughly dry should be sent up. Oil Paintings should never be sent between boards.

(*d*) To ensure greater safety in transit, casts, models, and specimens in materials of a fragile character should be first carefully packed separately in light boxes, and these packages then put into an ordinary packing case, care being taken to put enough straw or wood wool, not sawdust, around each package to prevent its shaking inside the outer packing case during transmission.

(*e*) Works should be addressed to the Secretary, Board of Education, South Kensington, London, S.W.

(*f*) In the case of registered Art students, the Board will pay the carriage of works sent by Goods Trains.

NOTICE.—It must be clearly understood that the Board do not hold themselves responsible for any loss or damage which may occur to the works. All reasonable care will be taken of them, while they are in the custody of the Board.



FOR OFFICIAL USE.

Rules 110.

BOARD OF EDUCATION.

REGULATIONS FOR EXAMINATIONS IN ART, 1914.

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1913.

Price Twopence.

5. No candidate will be admitted more than thrice to an Examination in the same subject, and no candidate will be admitted to an Examination in a subject in which he has already passed with distinction.

6. A fee of 10*s*. will be charged to candidates for admission to each Examination.

7.—(*a*) Candidates for admission to the Examinations in Drawing and in Industrial Design are not required to have passed any previous Examination.

(*b*) (i) Except as mentioned below, no candidate may attend the Examinations in Painting, Modelling, or Pictorial Design unless he has first passed the Examination in Drawing.

(ii) A candidate who holds the Art Master's Certificate *or the Full Associateship of the Royal College of Art* may attend the Examinations in Painting, Modelling, or Pictorial Design as supplementary tests affording evidence of specialised attainments.†

(iii) A candidate may attend the Examinations in Painting, Modelling, or Pictorial Design who has obtained a First Class in Drawing from the Antique and a First Class in Drawing from Life under the old system of Art Examinations.*

(iv) A candidate may be admitted to the Examination in Modelling if he has obtained a First Class in Drawing from Life, a Second Class in Drawing from the Antique, and a First Class in Modelling from the Antique, or if he has obtained a First Class in Drawing from the Antique, a Second Class in Drawing from Life, and a First Class in either Modelling from Life or Modelling the Head from Life.†

(v) The Board will be prepared to accept, in lieu of the Examination successes respectively specified above, evidence satisfying them that the candidate has corresponding qualifications equivalent to or higher than those attested by such successes.

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* First Class successes in Drawing from Life and Drawing from the Antique obtained at the special Art Examinations to be held in February, 1914, may be counted for this purpose. For the conditions of admission to these Examinations *see* paragraph 5 of Part II. of Rules 109.

† A candidate who desires to obtain the new Teaching Certificate in Art to be issued under the provisions set out in Rules 109 must satisfy the conditions specified in those Rules and in particular must pass the Drawing Examination unless he holds the Art Class Teacher's Certificate and has obtained a First Class in Drawing from the Antique and a First Class in Drawing from Life under the old system of Art Examinations, or at the special Art Examinations to be held in February, 1914. This condition applies to a candidate for the new Teaching Certificate who already holds the Art Master's Certificate or the Full Associateship of the Royal College of Art.

8. Candidates desiring to apply for admission to the Examination will be required to make their application through the Managers of the school they attend, if they are students at a school, and upon a prescribed form which should be duly completed and returned to the Board not later than March 1st. Applications for admission to the Examination received after this date may be refused by the Board. If the candidate's application is accepted by the Board he will be so informed, and will in due course be instructed as to the centre at which he will be required to present himself for Examination, and will be furnished with a ticket for admission.

9.—(*a*) Candidates, in addition to taking the prescribed tests, must by the first day of the Examination have ready for submission as testimonies of study such note-books and sketch-books as they have kept during the two years preceding the Examination, together with not more than two examples of finished work in each of the sub-divisions of the Syllabus which must have been executed by them without assistance during that period. These testimonies of study and works should be work done in the ordinary course of study, and it is not desired that intending candidates should specially prepare specimens of their work for this purpose. But the Board will in this connection raise no objection to the re-submission of works executed within the prescribed period which have already been accepted for the Art Class Teacher's Certificate or the Art Master's Certificate. If a candidate is not prepared to submit works in any particular sub-division of the Syllabus of the Examination he proposes to take, the reasons should in all cases be stated at the time application is made for admission to the Examination; and if earlier work covering the ground is available, the candidate must be prepared to submit it in substitution.

(*b*) The Managers presenting a candidate will be required to make arrangements for the collection and transmission of his testimonies of study in accordance with instructions which will be given by the Board.

(*c*) The records of successful works submitted for the Art Class Teacher's or Art Master's Certificates will be taken into account by the Examiners.

10. Candidates applying for admission to the Board's Examinations will be required to state upon their Application Forms whether they propose to compete for Royal Exhibitions, National Scholarships, Local Scholarships or Free Studentships, and to state for which of these awards they desire to be registered as competitors.*

* For particulars as to these Scholarships, reference should be made to the Interim Regulations for Awards in Art, 1914. The Awards will be determined by the results of the Board's Examinations in Drawing, Painting, Modelling, Pictorial Design, and Industrial Design; and, as regards Architectural Students, by the results of the Intermediate Examination of the Royal Institute of British Architects.

PREFATORY NOTE.

These Regulations for the Examinations in Art, 1914, are substantially identical with those issued by the Board for the Examinations in Art, 1913. It is important that candidates desiring to obtain the new Teaching Certificate in Art should read, together with paragraph 7 of these Regulations, Part I. of Rules 109, where the full requirements for that Certificate are set out.

Attention is called to the announcement in the second part of paragraph 2 that after 1915 no account will be taken of successes obtained under the former Scheme of Art Examinations.

As regards Appendix II. to these Regulations, the Board take this opportunity of explaining, for the information of Managers and Head Masters, that while they are of opinion that it is necessary for Schools of Art to have an available supply of full-sized casts, both for the purpose of direct study by the student and also for the special purpose of preparation for a test in Memory Drawing, they will not require any School to have full-sized casts of all the statues mentioned in paragraph 6 of Appendix I. as those which candidates for the Board's Examination in Drawing, 1914, will be required to study in preparation for a Memory Test.

L. A. Selby-Bigge

4th November 1913.

N.B.—New or substantially modified passages are printed in italics.

BOARD OF EDUCATION.

REGULATIONS FOR EXAMINATIONS IN ART, 1914.

1. In 1914 the Board of Education will hold Examinations in the following subjects :—

(*a*) Drawing.
(*b*) Painting.
(*c*) Modelling.
(*d*) Pictorial Design.
(*e*) Industrial Design.

The Examinations will be based upon the syllabuses published in Appendix I.

2. The subjects of each Examination will be sub-divided for the purpose of setting tests, but candidates must in all cases take the Examination as a whole, and marked success in one test will be allowed to compensate for comparative want of success in another. The fact that a candidate has passed under the former scheme of Art Examinations in any section of a subject covered by the Syllabus will not excuse him from entering for all the tests comprised in each Examination ; but the success then obtained will, if it is to his advantage, be specially taken into account, and the Board will not credit any candidate with a less measure of achievement in any section of a subject of the new Examinations covered by a previous success than that which he had reached at the time of his earlier Examination.

After 1915 *no account will be taken of successes obtained under the former scheme of Art Examinations.*

3.—(*a*) No candidate will be admitted to the Examination in Drawing in 1914 who will not be over 17 years of age on the 31st July 1914.*

(*b*) No candidate will be admitted to any of the other Examinations in 1914 who will not be over 19 years of age on the 31st July 1914.*

4. No candidate will be admitted in one year to an Examination in more than one of the subjects mentioned in paragraph 1 of these Regulations.

* *For the purpose of these Regulations a person is considered to complete each year of age immediately on the commencement of a birthday. Thus a person born on July* 31*st*, 1897, *is over* 17 *years of age on July* 31*st*, 1914, *and is qualified, therefore, for admission to the Examination in Drawing; but a person born on August* 1*st*, 1897, *is not.*

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5. No candidate will be admitted more than thrice to an Examination in the same subject, and no candidate will be admitted to an Examination in a subject in which he has already passed with distinction.

6. A fee of 10*s.* will be charged to candidates for admission to each Examination.

7.—(*a*) Candidates for admission to the Examinations in Drawing and in Industrial Design are not required to have passed any previous Examination.

(*b*) (i) Except as mentioned below, no candidate may attend the Examinations in Painting, Modelling, or Pictorial Design unless he has first passed the Examination in Drawing.

(ii) A candidate who holds the Art Master's Certificate *or the Full Associateship of the Royal College of Art* may attend the Examinations in Painting, Modelling, or Pictorial Design as supplementary tests affording evidence of specialised attainments.†

(iii) A candidate may attend the Examinations in Painting, Modelling, or Pictorial Design who has obtained a First Class in Drawing from the Antique and a First Class in Drawing from Life under the old system of Art Examinations.*

(iv) A candidate may be admitted to the Examination in Modelling if he has obtained a First Class in Drawing from Life, a Second Class in Drawing from the Antique, and a First Class in Modelling from the Antique, or if he has obtained a First Class in Drawing from the Antique, a Second Class in Drawing from Life, and a First Class in either Modelling from Life or Modelling the Head from Life.†

(v) The Board will be prepared to accept, in lieu of the Examination successes respectively specified above, evidence satisfying them that the candidate has corresponding qualifications equivalent to or higher than those attested by such successes.

---

* First Class successes in Drawing from Life and Drawing from the Antique obtained at the special Art Examinations to be held in February, 1914, may be counted for this purpose. For the conditions of admission to these Examinations *see* paragraph 5 of Part II. of Rules 109.

† A candidate who desires to obtain the new Teaching Certificate in Art to be issued under the provisions set out in Rules 109 must satisfy the conditions specified in those Rules and in particular must pass the Drawing Examination unless he holds the Art Class Teacher's Certificate and has obtained a First Class in Drawing from the Antique and a First Class in Drawing from Life under the old system of Art Examinations, or at the special Art Examinations to be held in February, 1914. This condition applies to a candidate for the new Teaching Certificate who already holds the Art Master's Certificate or the Full Associateship of the Royal College of Art.

8. Candidates desiring to apply for admission to the Examination will be required to make their application through the Managers of the school they attend, if they are students at a school, and upon a prescribed form which should be duly completed and returned to the Board not later than March 1st. Applications for admission to the Examination received after this date may be refused by the Board. If the candidate's application is accepted by the Board he will be so informed, and will in due course be instructed as to the centre at which he will be required to present himself for Examination, and will be furnished with a ticket for admission.

9.—(*a*) Candidates, in addition to taking the prescribed tests, must by the first day of the Examination have ready for submission as testimonies of study such note-books and sketch-books as they have kept during the two years preceding the Examination, together with not more than two examples of finished work in each of the sub-divisions of the Syllabus which must have been executed by them without assistance during that period. These testimonies of study and works should be work done in the ordinary course of study, and it is not desired that intending candidates should specially prepare specimens of their work for this purpose. But the Board will in this connection raise no objection to the re-submission of works executed within the prescribed period which have already been accepted for the Art Class Teacher's Certificate or the Art Master's Certificate. If a candidate is not prepared to submit works in any particular sub-division of the Syllabus of the Examination he proposes to take, the reasons should in all cases be stated at the time application is made for admission to the Examination; and if earlier work covering the ground is available, the candidate must be prepared to submit it in substitution.

(*b*) The Managers presenting a candidate will be required to make arrangements for the collection and transmission of his testimonies of study in accordance with instructions which will be given by the Board.

(*c*) The records of successful works submitted for the Art Class Teacher's or Art Master's Certificates will be taken into account by the Examiners.

10. Candidates applying for admission to the Board's Examinations will be required to state upon their Application Forms whether they propose to compete for Royal Exhibitions, National Scholarships, Local Scholarships or Free Studentships, and to state for which of these awards they desire to be registered as competitors.*

* For particulars as to these Scholarships, reference should be made to the Interim Regulations for Awards in Art, 1914. The Awards will be determined by the results of the Board's Examinations in Drawing, Painting, Modelling, Pictorial Design, and Industrial Design; and, as regards Architectural Students, by the results of the Intermediate Examination of the Royal Institute of British Architects.

11. The Art Examinations will be held on the days and at the hours set out in Appendix III.

12. Successful candidates in each Examination will be classified as having (1) passed the Examination, or (2) passed the Examination with distinction. Certificates of success will be issued and a result list will be published in due course. No prizes will be awarded in connection with the Examination.

The Local Management of Examinations.

13. If Managers desire to present candidates for Examinations, but do not wish to apply for the recognition of their School as an Examination Centre, it will rest with them to make arrangements for the attendance of such candidates with other Managers applying for the recognition of their School as an Examination Centre. In the absence of such arrangements the Board cannot undertake to provide Examinations for the candidates in question.

14.—(*a*) Applications by Managers of Schools of Art desiring the recognition of their Schools as Centres for the Art Examinations should be made to the Board on the prescribed forms not later than 15th March 1914. Particulars must be given of any arrangements which may have been made with other Managers under the preceding paragraph for the attendance of candidates from their Schools.

(*b*) There must also be submitted outline plans, drawn to one-eighth of an inch scale, of each floor proposed to be used for Examinations, showing the orientation, the floor space of each Examination room, the windows and other means of lighting, including artificial lighting if the room is to be used for Evening Examinations. The connections of the rooms one with another must also be shown.

(*c*) Examinations may only be held in rooms which are adequately lighted. The rooms should have level floors, should be without galleries, and should accommodate candidates so that they may be seated at written Examinations not less than five feet apart from centre to centre, and should provide such further space as may be required for tests other than written tests.

(*d*) The Board will in due course inform the Managers whether the application is approved and, if so, for what numbers of candidates at the several Examinations provision will be required.

15. The Managers of the School at which the Art Examinations are held will be regarded as responsible for the proper conduct of the Examination, and will be called upon to provide models for the tests in which models will be required to pose, and such materials for examination, for example, clay and plaster, as are not supplied by the Board of Education. Particulars as to the material which will be required will be forwarded by the Board to the Managers.

16. For the invigilation of the Examinations the Board recognise (*a*) Superintendents, and (*b*) Assistants to the Superintendents. These Invigilators may be either (i) Managers, or (ii) paid Superintendents or Assistants. Candidates for Examination, their relatives, teachers at the School where the Examination is held, or at any School attended by any of the candidates, or other persons having a direct interest in the success of a candidate, are ineligible to act as Invigilators for the Centre at which such candidates are to be examined.

17.—(*a*) *Each examination test held at any centre must be conducted under the supervision of a Superintendent appointed by the Managers for the purpose and acting under their direction.*

(*b*) Where more than one room is used for an examination test, or where the number of candidates under examination in one room is large, or where Examinations are held in L-shaped or T-shaped rooms, the Board may require the appointment of Assistants to take part in the invigilation under the direction of a Superintendent.

18. The name of each Superintendent or Assistant Superintendent must be submitted to the Board for approval by the Managers who propose to appoint him. Persons so nominated for approval must be qualified by their position or occupation to perform the duties of this office satisfactorily.

19. The Managers will be furnished with lists of the candidates whose admission to the Examination at the Centre has been approved by the Board. Admission to the Examination must be refused to all persons whose names have not been thus previously notified to the Managers, and each candidate should as a rule be required to produce for inspection the ticket supplied to him by the Board.

20.—(*a*) The Board will contribute to the daily expenses of superintending the Drawing, Painting, and Modelling Examinations at a Centre in respect of any days on which the Managers have had to provide for more than three candidates in all in those subjects. Where provision has been made for more than three candidates in all in Painting and Modelling together, the Board will contribute in respect of the last week of the Modelling Examination, even though the number of candidates is three or less.

(*b*) The Board will contribute to the daily expenses of superintending the Pictorial Design and Industrial Design Examinations at a Centre where the Managers have had to provide for more than three candidates in all in those subjects.

(*c*) Where the above conditions are satisfied the Board's contribution will be one-half the sum paid by the Managers as fees *for the necessary* superintendence and assistance in*

* The number of Superintendents and Assistant Superintendents which the Board will hold to be necessary for the superintendence of the Examinations will be notified to the Managers in due course.

superintendence in the several tests, provided that the contribution will not exceed—

(i) in respect of the Drawing, Painting, and Modelling Examinations the amount of 6*s*. per day for *each* Superintendent and 4*s*. per day for each Assistant Superintendent;

(ii) in respect of the Pictorial Design and the Industrial Design Examinations the amount of 4*s*. per afternoon or evening or 6*s*. per day for *each* Superintendent and 3*s*. per afternoon or evening or 4*s*. per day for each Assistant Superintendent.

Issue and Custody of Papers of Questions, &c.

21. The examination material, question papers and instructions for the several tests comprised in the Examinations will be issued by the Board to the person nominated by the Managers for the purpose, who may be *a* person nominated as *a* Superintendent. This person will be responsible for the safe custody and distribution of the question papers. The packets of examination papers must not in any circumstances be permitted to pass into the hands of any teacher or candidate for examination or of any person interested in the success of a candidate.

22. All possible care is taken to forward the examination papers and instructions required for the several Examinations, but the Board will not be responsible for subsequent loss or miscarriage or for mistakes attributable to candidates, Managers, or Superintendents.

23. Detailed instructions for the conduct and superintendence of Examinations will be issued in due course to Managers and Superintendents of Examinations. It will be the duty of *a* Superintendent to superintend the Examinations in accordance with these instructions and to forward the worked exercises as directed by the Board.

24.—(*a*) The Board, after such investigation as they think necessary, may cancel the Examination of all or any of the candidates, in cases where there is evidence of fraud or where there has been such breach of the instructions as in their opinion is sufficiently serious to invalidate the Examination, or, alternatively, may call upon all or any of the candidates to be re-examined. If any candidate should fail to appear at an investigation or decline to be re-examined the Board may cancel his Examination.

(*b*) The Board may make it a condition of the granting of any special Examination or test, in the event of the failure of an Examination through no fault of the Board, that the whole cost of such special Examination shall be met locally.

APPENDIX I.

NOTE.—New or substantially modified passages are printed in italics.

ART EXAMINATION SYLLABUSES.

SYLLABUS OF EXAMINATION IN DRAWING.

1. Candidates, in addition to taking the prescribed tests, must be prepared to submit, if required to do so, as testimonies of study, such note-books and sketch-books as they have kept during the two years preceding the Examination, together with not more than two examples of finished work in each of the subdivisions of the Syllabus, which must have been executed by them without assistance during that period.

2. The Examination in Drawing comprises the six tests set out below. The candidates must in all cases take the Examination as a whole, but marked success in one test may be allowed to compensate for comparative want of success in another. If a candidate has passed, under the former scheme of Art Examinations in any subjects covered by the Syllabus, the success then obtained will, if it is to his advantage, be fully taken into account; but the fact that a candidate has previously passed in subjects corresponding to any of the present tests will not excuse him from entering for all the six tests comprised in the Examination in Drawing.

3. The tests will mainly take the form of exercises to be worked by the candidates, but candidates will be required to express themselves clearly in written answers to questions on Anatomy.

(i) DRAWING FROM THE ANTIQUE.

4. Candidates will be required to make a drawing from a cast to be prescribed by the Examiners.

Drawings must be executed with the point, in either black chalk, Russian charcoal, carbon pencil or black lead pencil, upon a half imperial sheet of paper, and must be at least 15 and not more than 18 inches in height.

Four hours will be allowed.

(ii) DRAWING FROM LIFE.

5. Candidates will be required to make two drawings, (*a*) a direct drawing from a nude figure, and (*b*) a memory drawing of the same figure. Both drawings must be executed with the point in either black chalk, Russian charcoal, carbon pencil, or black lead pencil.

The model must be posed according to the instructions of the Examiners. The direct drawing should, as far as possible, fill a half imperial sheet of paper, whether the model be posed standing, seated, reclining, or otherwise. When these drawings have been collected and the model has been dismissed from the room, candidates will, after an interval of one hour, be required to make a drawing from memory of the view of the figure which they have just drawn. This drawing, upon a half imperial sheet of paper, should be about 15 inches high.

Five hours will be allowed—three for drawing from the model, one hour for an interval, and one hour for drawing from memory.

(iii) Drawing from Memory.

6. Candidates will be required to draw from memory :—

(*a*) Any two or more of the figures in the following list which may be selected by the Examiners :—

Belvedere Torso.
Venus of Milo.
Upright Discobolus.
Boy and Goose.
Lorenzo de' Medici (Michael Angelo).
Ilissus.
David (Donatello).

[N.B.—To this list will be added in 1915, Seated Hermes and Cupid (Michael Angelo); and in 1916, Hypnos, and Mercury (Giovanni da Bologna).]

The drawings must be about 9 inches in height, and must be executed with the point in either black chalk, Russian charcoal, carbon pencil, or black lead pencil.

(*b*) A familiar object of Natural History, such as a bird, an animal, a fish, to be selected by each candidate from a list made by the Examiners.

(*c*) A human figure in an action specified by the Examiners, to emphasise which drapery may be added by the candidate.

Four hours will be allowed.

(iv) Anatomy.

7. Candidates will be required, by means of written and illustrated answers to questions, to display a knowledge of the details of anatomy so far as they have an influence on man's external form in action and repose. This will entail a general acquaintance with the skeleton and the disposition of its parts, more particularly the bones and joints of the limbs, the superficial soft parts, and the form and arrangement of the muscles which influence the surface contours.

Candidates will also be expected to exhibit a knowledge of the variations in form and proportion dependent upon growth and sex, and to be familiar with the main principles involved in the maintenance of the erect posture.

It cannot be too strongly impressed upon candidates that they will be required to show proof of their ability to apply their knowledge of anatomy in analysing and drawing the figure by illustrating their answers as fully as possible with good sketches, for which higher credit will be given than for elaborately written descriptions.

Candidates will also have the option of making a drawing of a figure in action, in which the main features in its construction as regards bone and muscle must be clearly displayed.

Two hours and a half will be allowed.

(v) Perspective.

8. Candidates will be required to work two exercises.

(*a*) This exercise will require the drawing in perspective, with instruments, from plan and elevation, of one or two simple solids having plane or curved surfaces, with the chief lines horizontal and vertical, and having one line or surface upon the ground plane. The plan may show the object or objects in relation to vertical surfaces such as two walls of an interior.

The problem will be such as can be solved by means of lines in horizontal planes.

Candidates are expected to have a knowledge of the direct method employed by architects, and it may be required that the problem shall be worked in this method. There may also be required the drawing of the reflections of the solids in a plane horizontal mirror, or the drawing of the shadows of them when cast by the sun or by an artificial light within the picture upon horizontal or vertical surfaces, or upon surfaces of single curvature.

(*b*) This exercise will consist of sketching a view of a building from a plan and elevations. The subject may deal with the interior or exterior. The candidate may at his discretion introduce figures or other appropriate accessories.

The student must show, in a well-drawn rendering, his knowledge of the laws of perspective governing the main construction of the subject.

In the diagrams accompanying the paper of questions the following letters will represent the terms applied to the various points, lines, &c., used in working out the perspective scheme, viz.:—

H.L. Horizon Line.
C.V. Centre of Vision. The point on the picture plane directly opposite to the eye of the spectator.
E. Eye. The point showing the position of the eye of the spectator and its perpendicular distance from the picture plane.
G.P. Ground Plane.
G.L. Ground Line. The intersection of the ground plane with the picture plane.
I.L. Intersection Line. The line in which a plane, other than the ground plane, intersects the picture plane.
P.P. Picture Plane.
P.D. Point of Distance.
V.P. Vanishing Points of Lines.
V.L. Vanishing Lines of Planes.
C.V.L. Centre of Vanishing Line.
M.P. Measuring Point.
S. The Sun.
V.P.S.R. Vanishing Point of the Sun's Rays. The point to which, when the sun is behind the spectator, the parallel lines representing the sun's rays appear to vanish.
V.L.P.S. Vanishing Line of the Plane of Shade. The V.L. of the plane passing through the S. or V.P.S.R. and containing the line throwing the shadow.
L. Source of Artificial Light.
R.S. Reflecting Surface.

Three hours will be allowed.

(vi) Architectural Drawing.

9. Candidates will be required—

(*a*) to draw from memory to a given scale, in accordance with the Doric, Ionic, or Corinthian order (*in either its Greek or its Roman form*), a column of a given height, together with its entablature (architrave, frieze, and cornice).

(*b*) to set out to a scale of one-eighth inch to a foot the plan, sections and elevations of a building, of which the particulars and dimensions will be supplied by the Examiners, *i.e.*, the dimensions and shape of the building, the numbers and positions of the openings, the thickness of the walls, and the block sections of the roof.*

Four hours will be allowed.

SYLLABUS OF EXAMINATION IN PAINTING.

10. Candidates, in addition to taking the prescribed tests, must be prepared to submit, if required to do so, as testimonies of study, such note-books and sketch-books as they have kept during the two years preceding

* *This test is one in architectural drawing only, and candidates will not be required to show any knowledge of what is ordinarily called Building Construction, or of Architectural Design.*

the Examination, together with not more than two examples of finished work in each of the subdivisions (i), (ii), (iii) and (iv) of the Syllabus, which must have been executed by them without assistance during that period.

11. The Examination in Painting comprises the five tests set out below. The candidates must in all cases take the Examination as a whole, but marked success in one test may be allowed to compensate for a comparative want of success in another. If a candidate has passed, under the former scheme of Art Examinations, in any subjects covered by the Syllabus, the success then obtained will, if it is to his advantage, be fully taken into account; but the fact that a candidate has previously passed in subjects corresponding to any of the present tests will not excuse him from entering for all the five tests comprised in the Examination in Painting.

12. The tests will mainly take the form of exercises to be worked by the candidates, but candidates will be required in their written work to show evidence of reading in relation to their study and of some power to express themselves in writing.

(i) Drawing from Life.

13. Candidates will be required to make, upon a half imperial sheet of paper, a drawing of a nude figure, which must be executed with the point in either black chalk, Russian charcoal, carbon pencil, or black lead pencil.

The model must be posed according to the instructions of the Examiners. The drawing should, as far as possible, fill the paper, whether the model be posed standing, sitting, reclining, or otherwise.

Four hours will be allowed.

(ii) Painting from Life.

14. Candidates will be required to execute a painting from the nude figure, which may be painted at their discretion either in oil colour, water colour, or tempera.

The model must be posed against a plain tone background according to the instructions of the Examiners.

The size of the canvas for oil colour and for tempera will be 36 inches by 28 inches; that of the paper for water colour 22 inches by 15 inches.

Thirty hours, exclusive of intervals for rest, will be allowed.

(iii) Painting from Still Life, the Antique, or Drapery.

15. Candidates will be required to paint, as may be prescribed by the Examiners, either (*a*) a group of still life objects, such as a wineglass, a loaf, oranges, apples, a brass candlestick, a scarf, &c., selected by the Examiners and arranged by the candidate against a simple background; or (*b*) some white drapery arranged by the candidate on a lay figure or a cast against a plain tone background; or (*c*) a torso or some other fragmentary antique figure, such as the Belvedere Torso, the Theseus, the Ilissus, &c. Credit will be given, in the case of (*a*) or (*b*), for good arrangement by the candidate.

The painting may be in oil colour, water colour, or tempera, at the discretion of the candidates. The size of the canvas or paper to be used will be prescribed by the Examiners.

Twenty hours, exclusive of intervals for rest, will be allowed.

(iv) Figure Composition.

16. Candidates will be required to invent and paint in oil colour, water colour, tempera, or in fresco, at their discretion, a composition of figures suitable for a panel, an over-door, a lunette, a spandril, or the like. The subject of the composition and the architectural conditions to which it is to be related will be prescribed by the Examiners. Each candidate must

also make a sketch showing the composition on the wall for which it is designed, and indicating the general colour scheme of the room or other surroundings in which it is placed.

The size of the canvas, paper, or wooden backing for fresco to be used will be prescribed by the Examiners.

Thirty hours, exclusive of intervals for rest, will be allowed.

(v) History and Methods of Painting.

17. Candidates will be required to answer questions on—
(*a*) The History of Painting, ancient and modern.
(*b*) The Methods of Painting, including both traditional and modern processes.

Four hours will be allowed.

SYLLABUS OF EXAMINATION IN MODELLING.

18. Candidates in addition to taking the prescribed tests, must be prepared to submit, if required to do so, as testimonies of study, such note-books and sketch-books as they have kept during the two years preceding the Examination, together with not more than two examples of finished work in each of the subdivisions (i), (ii), (iii), (iv) and (v) of the Syllabus, which must have been executed by them without assistance during that period.

19. The Examination in Modelling comprises the six tests set out below. The candidate must in all cases take the Examination as a whole, but marked success in one test may be allowed to compensate for a comparative want of success in another. If a candidate has passed, under the former scheme of Art Examinations, in any subjects covered by the Syllabus, the success then obtained will, if it is to his advantage, be fully taken into account; but the fact that the candidate has previously passed in subjects corresponding to any of the present tests will not excuse him from entering for all the six tests comprised in the Examination in Modelling.

20. The tests will mainly take the form of exercises to be worked by the candidates, but candidates will be required in their written work to show evidence of reading in relation to their study and of some power to express themselves in writing.

21. In each of the following tests, with the exception of Modelling Hand and Wrist, the models may be cast either by the candidate, or by a professional moulder, or by some other person skilled in casting.* The models should be covered with plaster—the first stage of the casting process—as soon as possible after the expiration of the time allowed for the tests.

(i) Modelling from Life.

22. Candidates will be required to model from the life a nude figure in the round, to be not less than 2 feet in height, exclusive of the base.

The figure must be posed according to the instructions of the Examiners.

Forty-two hours, exclusive of intervals for rest, will be allowed.

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* *If the candidate elects to cast his own works (other than the model of Hand and Wrist) he may receive assistance, provided that the Board have previously approved any arrangements proposed for the purpose. Any assistance that may be afforded to the candidate in casting his models, however, must not be given by a teacher of Modelling.*

(ii) Modelling Hand and Wrist.

23. Candidates will be required to model from the life a full-size model in the round of a hand and wrist posed upon a slab.

Each candidate must cast his model without assistance.

Twelve hours, exclusive of intervals for rest, will be allowed for the modelling, and six additional hours, exclusive of intervals for rest, for the casting.

(iii) Modelling Ornament and Drapery.

24. Candidates will be required to model in relief, from a cast, photograph or engraving, as may be prescribed by the Examiners, an architectural feature including ornamental detail and drapery.

Six hours, exclusive of intervals for rest, will be allowed.

(iv) Figure Composition.

25. Candidates will be required to invent and model a composition of figures for a lunette, a panel, a spandril, a pediment, &c., together with the architectural features, including mouldings or other settings, necessary to complete a harmonious design. The subject of the composition and the architectural conditions to which it is to be related will be prescribed by the Examiners.

Twenty-four hours, exclusive of intervals for rest, will be allowed.

(v) Modelling Design.

26. Candidates will be required to model an original design, without the use of the human figure, on a subject prescribed by the Examiners. The design must be practically adapted to reproduction according to some recognised process, such as woodcarving, stonecarving, metal forging, metal casting, pottery, or the like. Each candidate will be required, at the time of applying for permission to enter for the Examination, to name the process in relation to which he desires to be tested.

Seven hours, exclusive of intervals for rest, will be allowed.

(vi) History and Methods of Sculpture.

27. Candidates will be required to answer questions on—

(*a*) The History of Sculpture, ancient and modern,

(*b*) The methods of Sculpture, Carving, and Modelling, including both traditional and modern processes.

Two papers, occupying three hours each, will be set.

SYLLABUS OF EXAMINATION IN PICTORIAL DESIGN.

28. Candidates, in addition to taking the prescribed tests, must be prepared to submit, if required to do so, as testimonies of study, such note-books and sketch-books as they have kept during the two years preceding the Examination, together with not more than two examples of finished work in each of the sub-divisions (i), (ii) and (iii) of the Syllabus, which must have been executed by them without assistance during that period.

29. The Examination in Pictorial Design comprises the four tests set out below. The candidates must in all cases take the Examination as a whole, but a marked success in one test may be allowed to compensate for a comparative want of success in another. If a candidate has passed, under the former scheme of Art Examinations, in any subjects covered by the Syllabus, the success then obtained will, if it is to his advantage, be fully taken into account; but the fact that the candidate has previously

passed in subjects corresponding to any of the present tests will not excuse him from entering for all the four tests comprised in the Examination in Pictorial Design.

30. The tests will mainly take the form of exercises to be worked by the candidates, but candidates will be required in their written work to show evidence of reading in relation to their study and of some power to express themselves in writing.

(i) Elementary Design.

31. Candidates will be required to work exercises and answer questions, showing knowledge of—

(*a*) The principles of design (such as Light and Shade, Colour and composition) in relation to their special process and its history;
(*b*) The enlargement and reduction of designs according to scale;
(*c*) Subsidiary matters, such as lettering (including Roman and its developments, Gothic, &c., capitals, lower-case, and numerals), costume, English heraldry, and the like.

Six hours will be allowed.

(ii) Figure Composition.

32. Candidates will be required to invent and execute a Pictorial Composition on a subject prescribed by the Examiners, suitable at the discretion of the candidates either for a book illustration, or for a poster. The dominant feature of the composition must be the human figure, though animal forms or monsters may be introduced.

A composition for a book illustration should be drawn of a size suitable to an octavo or quarto page. If the design is in black and white, it should be drawn preferably in pen and ink, though water-colour monochrome appropriate to purposes of reproduction may be used. If the design is in colour it must be in water-colour and of a kind suitable to reproduction by some ordinary colour process.

A composition for a poster may be of any proportions that can be contained on an imperial sheet of paper, the scale to which the drawing is made being stated; and may be executed either in black-and-white or in colour.

Six hours, exclusive of intervals for rest, will be allowed.

(iii) Original Design.

33. Candidates will be required to make an original design, without the use of the human figure, on a decorative motive prescribed by the Examiners. The design must be practically adapted to reproduction according to some recognised process, such as Engraving in metal or wood, Etching, Wood-cutting, Lithography, Colour-Printing, or a photographic process to be specified by the candidate. Each candidate will be required, at the time of applying for permission to enter for the Examination, to name the process in relation to which he desires to be tested. The design may be made in pen and ink, pencil, chalk, charcoal, or water-colour, at the discretion of the candidate, upon a half imperial sheet of paper, or upon metal or wood in the case of processes ordinarily so carried out.

Six hours, exclusive of intervals for rest, will be allowed.

(iv) History and Methods of Engraving and other Processes of Artistic Reproduction.

34. Candidates will be required to answer questions on the History and Methods of Engraving and other processes of artistic reproduction.

Three hours will be allowed.

SYLLABUS OF EXAMINATION IN INDUSTRIAL DESIGN.

35. Each candidate will be required to name, at the time of applying for permission to enter for the Examination, a craft in relation to which he desires to be examined. The crafts must be selected from the following list, in which letters are placed in brackets after the names of the crafts to indicate whether they are regarded as crafts which involve respectively modelling (M.), a knowledge of architecture (A.), and the use of the figure (F.):—

LIST OF CRAFTS.

Iron Work (M. A.).
Lead Work (M. A.).
Light Metal Work (M. A. F.).
Gold and Silver Smithing (M. A. F.).
Jewellery (M. F.).
Enamelling (F.).
Die Sinking (M. F.).
Stone Carving (M. A. F.).
Plastering (M. A. F.).
Painting and Decorating (A.).
Wall-paper Manufacture (A.).
Mosaic (A. F.).
Glass Painting (A. F.).
Wood Carving (M. A. F.).
Cabinet Work (A.).
Wood Inlaying (A.).
Pottery (M. F.).
Tile Painting and Modelling (M. F.).
Glass Blowing (M.).
Tapestry (A. F.).
Embroidery (F.)
Dress Design.
Lace Making.
Carpet Weaving.
Linen Weaving.
Silk Weaving.
Wool Weaving.
Cotton Printing.
Typography.
Illumination (A. F.).
Book Binding.

36. Candidates, in addition to taking the prescribed tests, must be prepared to submit, if required to do so, as testimonies of study:—

(*a*) Such note-books and sketch-books as they have kept during the two years preceding the Examination;

(*b*) If their craft involves Modelling, one finished drawing from a cast of Historic Ornament and one example of finished modelling from such a cast, and if their craft does not involve modelling, two finished drawings from *a cast of* Historic Ornament only;*

(*c*) At least one complete product of their craft produced as well as designed by them, or, where the conditions of manufacture render this impossible, full working drawings or models prepared by them for such a product;

(*d*) Evidence in the form of actual drawings that they have studied and drawn good historic examples of their craft;

(*e*) Evidence that they have followed a course of study appropriate to their craft, which must have included in the case of crafts involving modelling, Modelling from the Antique; in the case of crafts not involving modelling, Drawing from the Antique and Drawing from Memory of Natural Objects; and also, in the case of crafts involving a knowledge of architecture, Architectural Drawing.

All work submitted under (*b*), (*c*), and (*d*) must have been executed by candidates without assistance other than in the form of criticism during the two years preceding the Examination.

In considering work from the Antique, importance will be attached to accuracy of copying, and to careful study of details, such as hands and feet.

It will not be necessary for candidates who have already passed the Board's new Examinations in Drawing or in Modelling to submit testimonies of study in branches of work covered by those Examinations.

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* *The cast referred to in this paragraph should be one involving architectural detail and drapery.*

37. The Examination in Industrial Design comprises the four tests set out below. Each candidate must in all cases take the tests prescribed for his craft as a whole, but marked success in one test may be allowed to compensate for a comparative want of success in another. If a candidate has passed, under the former scheme of Art Examinations, in any subjects covered by the following Syllabuses, the success then obtained will, if it is to his advantage, be fully taken into account; but the fact that a candidate has previously passed in subjects corresponding to any of the present tests will not excuse him from entering for all the tests comprised in the Examination in Industrial Design.

38. The tests will mainly take the form of exercises to be worked by the candidates, but candidates will be required in their written work to show evidence of reading in relation to their study and of some power to express themselves in writing.

(i) Drawing or Modelling from Historic Ornament.

39.—(*a*) Candidates whose crafts do not involve modelling will be required to make a shaded drawing, upon a half imperial sheet of paper, from a cast, of an architectural feature involving ornamental detail and drapery.

The drawing may be in either pencil, chalk, pen-and-ink, or wash in water-colour, and must not be of the same size as the example selected for copying.

No ruling, measuring, or use of instruments is allowed.

Three hours will be allowed.

(*b*) Candidates whose crafts involve modelling will be required to model from a cast an architectural feature including ornamental detail and drapery.

This model must be cast by the candidate without assistance.

Six hours, exclusive of intervals for rest, will be allowed for the modelling, and six additional hours, exclusive of intervals for rest, for the casting.

(ii) Elementary Design.

40. All candidates will be required to work exercises and answer questions showing knowledge of—

(*a*) the principles of Design (such as the relation of Material to Design, Light and Shade, Colour, and Composition) in relation to their special craft and its history;

(*b*) the enlargement and reduction of designs according to scale, the preparation of working drawings, and the ordinary materials, tools, machinery, processes and measurements of their craft;

(*c*) subsidiary matters, such as lettering (including Roman and its developments, Gothic, &c., capitals, lower-case, and numerals), costume, English heraldry, and the like.

Six hours will be allowed.

(iii) Original Design.

41. All candidates will be required to make an original design on a motive and for a purpose prescribed by the Examiners. The design must be practically adapted to production by the selected craft. The use of the figure may be required, if the craft is one involving that use. The style of the design will be entirely at the candidate's choice, and may be based upon some historic style, or upon natural foliage, or otherwise. If the craft is one involving modelling, the design must be modelled. Candidates will be

required to give a rough estimate of the cost of carrying out their designs, or, where this is not practicable, to show some knowledge of the factors determining the cost.

Eight hours, exclusive of intervals for rest, will be allowed.

(iv) History and Styles of Ornament.

42. All candidates will be required to answer questions on the History and Styles of Ornament, with special reference to the relation of ornament to architecture and to the industrial arts. They must show correct knowledge of the current nomenclature of ornament and of the various kinds of pattern.

Three hours will be allowed.

APPENDIX II.

LISTS OF STATUES SUITABLE FOR STUDY IN SCHOOLS OF ART.

Classical.

Vaison Athlete (Vaison Diadumenos). (British Museum. Marble. Height, 6 ft. 8 ins.)
Marsyas. (British Museum. Bronze. Height, 2 ft. 8 ins.)
Boy extracting Thorn. (Palazzo de' Conservatori, Rome. Bronze. Height, 2 ft. 7½ ins.)
Boy and Goose (Museo Capitolino, Rome. Marble. Height, 3 ft. 3 ins.)
Clapping Faun. (Museo Nazionale, Florence. Marble. Height, 4 ft. 10 ins.)
Faun. (Naples Museum. Bronze. Height, 2 ft. 5½ ins.)
Narcissus. (Naples Museum. Bronze. Height, 2 ft. 11 ins.)
Seated Hermes. (Naples Museum. Bronze. Bronze Cast in British Museum. Height, 4 ft.)
Ilissus, from the Parthenon. (British Museum. Marble. Height, 2 ft. 8 ins. Width, 6 ft. 2½ ins.)
Reclining Theseus, from the East Pediment of the Parthenon. (British Museum. Marble. Height, 4 ft. 2½ ins. Width, 5 ft. 7 ins.)
Richmond Torso of Venus. (British Museum. Marble. Height, 2 ft. 8 ins.)
Belvedere Torso. (Vatican, Rome. Marble. Height, 3 ft. 10 ins.)
Athlete with Strigil, also called the Apoxyomenos of the Braccio Nuovo. (Vatican, Rome. Marble. Height, 6 ft. 10 ins.)
Venus of Milo. (Louvre, Paris. Marble. Height, 6 ft. 11½ ins.)
Upright Discobolus. (Vatican. Marble. Height, 5 ft. 9½ ins.)
Hermes of Praxiteles. (Olympia. Marble. Height, 7 ft. 6¼ ins.)
Farnese Hermes. (British Museum. Marble. Height, 6 ft. 11 ins.)
The Lizard Slayer or Sauroctonus. (Vatican, Rome. Marble. Height, 5 ft. 6 ins.)
Satyr with Dionysus. (Louvre, Paris. Marble. Height, 6 ft. 2 ins.)
Esquiline Venus. (Palazzo de' Conservatori, Rome. Marble. Height, 5 ft. 2 ins.)
Victory of Samothrace. (Louvre, Paris. Marble. Height, 7 ft. 7½ ins.)
Hypnos. (Madrid. Marble. Height, 4 ft. 11 ins.)

Donatello.

David. (Museo Nazionale, Florence. Bronze. Height, 5 ft. 4 ins.)

Michael Angelo.

The Slave. (Louvre, Paris. Marble. No. 379 in Louvre Catalogue. Height, 7 ft.)
Lorenzo de' Medici, called Il Pensieroso. (Medici Chapel, S. Lorenzo, Florence. Marble. Height, 5 ft. 11 ins.)
Night. (Medici Chapel, S. Lorenzo, Florence. Marble.)
Cupid. (Victoria and Albert Museum. Marble. Height, 3 ft. 5½ ins.)
Bacchus. (Museo Nazionale, Florence. Marble. Height, 6 ft. 11 ins.)

Sansovino.

Bacchus. (Museo Nazionale, Florence. Marble. Height, 4 ft. 9 ins.)

Giovanni da Bologna and his School.

Mercury. (Museo Nazionale, Florence. Bronze. Height, 6 ft. 3½ ins.)
Venus. (Boboli Gardens, Florence. Marble. Height, 4 ft. 4 ins.)

Edme Bouchardon.

L'amour taillant un arc. (Louvre, Paris. Marble. Height, 5 ft. 7 ins.)

A. Houdon.

Diana. (Hermitage, St. Petersburg. Bronze. Replica in Louvre, Paris. Height, 6 ft. 9 ins.)

J. B. Pigalle.

Mercury. (Kaiser Friedrich Museum, Berlin. Marble. Reduced Replica in Louvre, Paris. Height, 6 ft.)

APPENDIX III.

TIME TABLES OF EXAMINATIONS.

EXAMINATION IN DRAWING.

Anatomy	Saturday, 23 May	10.30 a.m. to 1 p.m.
Drawing from the Antique.	„ „	2 p.m. to 6 p.m.
Drawing from Life	Monday, 25 May	10.30 a.m. to 1.30 p.m., 2.30 p.m. to 3.30 p.m.
Perspective	Tuesday, 26 May	10.30 a.m. to 1.30 p.m.
Drawing from Memory	„ „	2.30 p.m. to 6.30 p.m.
Architectural Drawing	Wednesday, 27 May	10.30 a.m. to 2.30 p.m.

EXAMINATION IN PAINTING.

Drawing from Life	Saturday, 23 May	10.30 a.m. to 1.30 p.m., and 2.30 p.m. to 3.30 p.m.
History and Methods of Painting.	Monday, 25 May	10.30 a.m. to 2.30 p.m.
Painting from Still Life, Antique or Drapery.	Tuesday, 26 May, to Thursday, 28 May, and	10.30 a.m. to 1.30 p.m., and 2.30 p.m. to 5.30 p.m. each day.
	Friday, 29 May	10.30 a.m. to 12.30 p.m.
Painting from Life	Monday, 8 June, to Wednesday, 10 June (inclusive), and Friday, 12 June, to Monday, 15 June (inclusive).	10.30 a.m. to 1.30 p.m., and 2.30 p.m. to 4.30 p.m. each day.
Figure Composition	Tuesday, 16 June, to Saturday, 20 June (inclusive).	10.30 a.m. to 1.30 p.m., 2.30 p.m. to 5.30 p.m. each day.

EXAMINATION IN MODELLING.

History and Methods of Sculpture.	Saturday, 23 May	10.30 a.m. to 1.30 p.m., and 2.30 p.m. to 5.30 p.m.
Modelling Ornament and Drapery.	Monday, 25 May	10.30 a.m. to 1.30 p.m., and 2.30 p.m. to 5.30 p.m.
Casting	Tuesday, 26 May	10.30 a.m. to 1.30 p.m., and 2.30 p.m. to 5.30 p.m.
Modelling Hand and Wrist.	Wednesday, 27 May, and Thursday, 28 May.	10.30 a.m. to 1.30 p.m., and 2.30 p.m. to 5.30 p.m. each day.
For Candidates to Cast Models of Hand and Wrist.	Friday, 29 May	10.30 a.m. to 1.30 p.m., and 2.30 p.m. to 5.30 p.m.
Modelling from Life	Monday, 8 June, to Monday, 15 June, (inclusive).	10.30 a.m. to 1.30 p.m., and 2.30 p.m. to 5.30 p.m. each day.
Casting	Wednesday, 17 June, to Friday, 19 June, (inclusive).	10 a.m. to 1.30 p.m., and 2.30 p.m. to 6.30 p.m. each day.

Modelling Design -	Saturday, 20 June -	10.30 a.m. to 1.30 p.m., 2.30 p.m. to 5 p.m., and 5.30 p.m. to 7 p.m.
Casting - -	Monday, 22 June, and Tuesday, 23 June.	10.30 a.m. to 1.30 p.m., and 2.30 p.m. to 5.30 p.m. each day.
Figure Composition -	Wednesday, 24 June, to Saturday, 27 June (inclusive).	10.30 a.m. to 1.30 p.m., and 2.30 p.m. to 5.30 p.m. each day.
Casting - -	Monday, 29 June, to Thursday, 2 July (inclusive).	10.30 a.m. to 1.30 p.m., and 2.30 p.m. to 5.30 p.m. each day.

(*See* the Note as to Casting on page 22.)

EXAMINATION IN PICTORIAL DESIGN.

History and Methods of Engraving.	Monday, 25 May -	7 p.m. to 10 p.m.
Elementary Design -	Tuesday, 26 May, and Wednesday, 27 May.	7 p.m. to 10 p.m. each day.
Figure Composition -	Monday, 15 June and Tuesday, 16 June.	7 p.m. to 10 p.m. each day.
Original Design - -	Wednesday, 17 June, and Thursday, 18 June.	7 p.m. to 10 p.m. each day.

EXAMINATION IN INDUSTRIAL DESIGN.

History and Styles of Ornament.	Monday, 25 May -	7 p.m. to 10 p.m.
Elementary Design -	Tuesday, 26 May, and Wednesday, 27 May.	7 p.m. to 10 p.m. each day.
**Drawing from Historic Ornament.*	Monday, 8 June -	7 p.m. to 10 p.m.
†*Modelling from Historic Ornament.*	Monday, 8 June, and Tuesday, 9 June -	7 p.m. to 10 p.m. each day.
Casting Historic Ornament.	Saturday, 13 June -	2 p.m. to 10 p.m.
Original Design - -	Wednesday, 17 June, Thursday, 18 June, and	7 p.m. to 10 p.m. each day.
	Friday, 19 June -	7 p.m. to 9 p.m.
†Casting Original Designs.	Saturday, 20 June -	2 p.m. to 10 p.m.

(*See* the Note as to Casting on page 22.)

* To be taken by candidates who select crafts which do not involve modelling, viz., Enamelling, painting and decorating, wall-paper manufacture, mosaic, glass painting, cabinet work, wood inlaying, tapestry, embroidery, dress design, lace-making, carpet weaving, linen weaving, silk weaving, wool weaving, cotton printing, typography, illumination, book-binding.

† To be taken by candidates who select crafts which involve modelling, viz., Iron work, lead work, light metal work, gold and silver smithing, jewellery, die sinking, stone carving, plastering, wood carving, pottery, tile painting and modelling, glass blowing.

Note as to Casting.

N.B.—(i) The candidate is required to cast his own exercise in two cases only, viz., Modelling the Hand and Wrist (Modelling Examination), and Modelling from Historic Ornament (Industrial Design Examination).

(ii) In other cases models may be cast either by the candidate, *with or without assistance*, or by a professional moulder or other person skilled in casting. (*See* paragraph 21 of the Art Examination Syllabuses, in Appendix I.)

(iii) All casting, whether by the candidate or by any other person, must be done at the Examination Centre under superintendence within the hours respectively indicated in the Time Tables above.

Rules 108.

BOARD OF EDUCATION.

REGULATIONS

FOR THE

NATIONAL COMPETITION, 1914.

LONDON:
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1913.

CONTENTS.

(N.B.—Certain passages which did not appear in the Rules for 1913 are printed in italics.)

BOARD OF EDUCATION, WHITEHALL, LONDON, S.W.

REGULATIONS FOR THE NATIONAL COMPETITION, 1914.

The National Competition of 1914 will be held under the conditions stated in these Regulations. Articles 70, 72, 74, and 75 of the Regulations for Technical Schools, &c., 1909–10 are hereby cancelled.

General Conditions.

1.—(*a*) The National Competition is open to registered students of Schools and Classes recognised for the year 1913–14 under the Regulations for Technical Schools, &c., or under the Statement of Grants available in aid of Technological and Professional work in Universities. It is also open to registered students of Schools and Classes in Art recognised by the Scotch Education Department or by the Department of Agriculture and Technical Instruction for Ireland. On the application of the Government or Educational Department or other responsible Public Authority registered students of Schools and Classes in Art in any Dominion, Colony, or Dependency, may be admitted to the Competition.

(*b*) Managers and Teachers of Schools and Classes, intending to submit students' works for the National Competition, 1914, are requested to remember that only such works should be selected as appear to them to possess special excellence and to have a reasonable chance of gaining awards.

2. All works submitted must have been wholly executed during the twelve months from 1st April, 1913, to 31st March, 1914, by registered students in the class-room during the hours of meeting of the School or Class as part of their course of instruction during that period; but studies, executed away from the School, of growing flowers, fruit, plants, &c., of buildings, of objects in public and private collections, and of manufactured works in material, are eligible, if each is marked by the Master as executed entirely under his supervision. This condition also applies to works executed in the School from sketches or measurements made away from the School. *Works already submitted for the Art Class Teacher's or Art Master's Certificate are eligible, provided that they have been executed during the prescribed period and under the prescribed conditions.*

3. Specimens in various materials, though not executed by the students, and work executed by them but not under the

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conditions set forth in the preceding paragraph, may be sent up with the original drawn, modelled, or painted designs, if necessary to illustrate or explain these.

4.—(i) A person is ineligible to submit a work for the National Competition who either—

(*a*) has *during the period 1st April*, 1913, *to 31st March*, 1914, taught in any School, whether recognised by the Board of Education or not, the subject in which it is proposed to submit a work; or

*(*b*) has been a student of the Royal College of Art during the period April 1st, 1913, to March 31st, 1914, or

†(*c*) has at any time attended the Royal College of Art as a Student-in-Training, Royal Exhibitioner, National Scholar, Free Student, Royal College of Art Scholar, Junior Scholar, Local Exhibitioner, or Local Scholar, or has at any time been granted free admission at that College.

(ii) If any works by ineligible persons are submitted for the National Competition, they will be ignored; that is to say, no entries in respect of them will appear in the Result List and they will not be included in the Exhibition.

(iii) The Board may, if they think fit, require any competitor to undergo a special test set by them and carried out under conditions similar to those of the Art Examinations, or, in the case of a competitor who habitually designs not on paper but in material, under conditions appropriate to his craft. If the result of this test is unsatisfactory the Board may exclude the work from the Competition.

5. The latest day for sending up works is the **1st April, 1914.**‡ Notice is given that the Board may be unable to admit any exceptions to this regulation.

Subjects, Numbers, and Dimensions of Works, &c.

6. The subjects and divisions of subjects in which works may be submitted for the Competition are set out below. Further details are given in the Appendix.

Subjects 8*b*[1] to 8*f* inclusive. Drawing the human figure, or animal forms, from the "round" or from nature.

Subjects 9*a* to 9*d*[2] inclusive. Anatomical studies of the human figure or of animal forms.

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* *A student of the Royal College of Art may submit a work for the National Competition if the work was entirely executed by him between the 1st April* 1913 *and the date of his entry to the Royal College of Art.*

† *This paragraph does not apply to students who have only attended the Summer Courses at the Royal College of Art, such as those referred to in paragraphs* 26 *and* 27 *of the Interim Regulations for Scholarships and other Awards in Art*, 1914.

‡ *In the case of works from the Dominions, Colonies, and Dependencies, special provisions are applicable.*

Subjects 10*a* to 10*c* inclusive. Drawing flowers, foliage, landscape details, and objects of Natural History from nature.

Subject 12*a*. Painting ornament from the cast, &c.

Subject 14*a*. Painting (from nature) flowers or still-life in water-colour, oil, or tempera, without backgrounds.

Subjects 14*b* and 14*c*. Painting views of buildings, drapery.

Subjects 15*a* and 15*b*. Painting (from nature) groups of still-life, flowers, &c., as compositions of colour.

Subject 16*a*. Painting the human figure or animals in monochrome from casts.

Subjects 17*b* and 17*c*. Painting the human figure or animals.

Subjects 18*b* and 18*c*. Modelled, carved, or wrought studies of ornament.

Subjects 19*a* to 19*f*, also 19*h* to 19*l*. Modelled, carved, or wrought studies of the human figure, animals, &c.

Subject 20. Modelled, carved, or wrought studies of fruits, flowers, foliage, and objects of Natural History from nature.

Subject 22*a*. Studies of plants, birds, fishes, &c., as preparatory studies for Design.

Subjects 22*b*, 22*d* and 22*e*. Elementary Design.

Subjects 23*a* to 23*h* inclusive. Drawings from actual measurements of structures, machines, &c.; original applied designs; technical or miscellaneous studies.

Subject 24. Work designed and executed in material wholly by the student:—

(*a*) Complete objects or articles.

(*b*) Portions of objects or articles.

(*c*) Surface decoration of objects or articles.

7.—(*a*) Only two sheets of work in a Subject, or one set of modelled, carved, or wrought studies when mounted on boards, or in the case of unmounted works two examples, may be selected to represent any one student, except that—

(i) in Subject 23*a*, one set of not more than four carefully finished drawings with sketches and measurements may be submitted;

(ii) in Subject 23*g*, one set of not more than four pencil drawings with inked tracings and blue prints may be submitted, with sketches and measurements;

(iii) in Subjects 23*b*, *c*, *d*, *e*, *f*, *h*, and 24, examples of a student's work in the various branches of Design which he is studying, may be submitted.

(*b*) In the case of works in Subjects 24 (*b*) and (*c*) the extent of the portion actually designed and worked in material by the student must be clearly indicated.

(*c*) Stencil plates, wood blocks, and etchings on copper plates, &c., may accompany proofs and impressions from them, but it is preferable that proofs and impressions alone should be submitted.

(*d*) In the case of designs the purpose of the design, and the process and material in which it is intended that it should be carried out, must be clearly indicated. Designs for different processes of manufacture, and works in different subjects, should not be mounted on the same sheet.

(*e*) On all short time studies under Subject 8*e* the time taken must be clearly stated. Painted short time studies (Subject 17*d*) are ineligible.

(*f*) Works in plaster of Paris should be in white plaster only.

(*g*) Modelled, carved, or wrought studies from the cast of the same dimensions as the originals are not admissible.

(*h*) Drawn and painted studies glazed or in frames may not be submitted.

(*i*) When fresh painting has been executed over an old painting, this should be stated on the back of the canvas.

8. *Works will not be admitted to the Competition unless they comply with the following requirements as to dimensions :—*

(*a*) The maximum dimensions for drawings and paintings are—

48 in. × 48 in. for drawings or paintings in Subjects 23*a* to 23*h*, except that studies in Naval Architecture may be longer than 48 in., if submitted rolled.

48 in. × 36 in. for paintings from the living model.

36 in. × 25 in. for paintings from the Antique, Still Life, Interiors, &c.

32 in. × 22 in. for drawings in chalk, pencil, or similar materials.

(*b*) The maximum dimensions for modelled, carved or wrought studies are—

36 in. × 24 in. for each Figure, Bust, Group, &c.

36 in. × 24 in. for each panel, and for each board upon which studies are mounted.

(*c*) The limits of size apply also to mounts used for any drawings, &c.

(*d*) The greatest length of works or specimens in material must not exceed 6 ft., and the sum of the three dimensions—length, breadth, and height—must not exceed 12 ft., except that each unmounted foldable piece of woven, printed, or stencilled fabric, embroidery, or lace (Subject 24), must not exceed 9 ft. × 9 ft.

(*e*) On application to the Board, permission may, in exceptional cases, be given for *candidates in Mural Decoration, Stained Glass, Wrought Iron, Modelling Design and Modelling from the nude living model, to submit works of larger dimensions, provided they have previously been successful in advanced examinations held by the Board in analogous subjects. Application should be made for the purpose before the submission of such works and in any case not later than the* 1*st March*, 1914.

Labelling, Scheduling, Packing, and Forwarding of Works.

9. Works must be labelled and scheduled as prescribed below, and in any supplementary instructions or forms the Board may issue for the purpose.

(*a*) The number of the School or Class, the Student's name in full, his age and occupation, and the Subject-number of the work, must be shown on each work or specimen submitted. Wherever possible, the official label should be used; but for any work for which this is not convenient, the required information may be printed, stamped, or incised on the work itself.

(*b*) Form 807.T. must be carefully filled up in accordance with the instructions on page 1 of that Form.

(*c*) Form 808.T., and not Form 807.T., must be used for specimens which have not been executed in material by the students, or which have been executed by them but not under the prescribed conditions. Such specimens will be received only as illustrations of accompanying designs.

(*d*) Copies of Form 807.T., &c., will be ready for issue early in 1914. They will be issued in duplicate. One copy carefully filled up must be forwarded by the 1st April, 1914, to the Board, by post; it must not be enclosed with the package of works. The other copy should be retained for reference.

(*e*) The Board will supply a special form for inclusion in each package as an inventory of its contents, and a duplicate to be retained for reference.

10.—(*a*) The Board do not provide cases for packing students' works.

(*b*) The works, after they have been labelled and entered on Form 807.T. &c., must be packed so that they will not shift, nor rub one over the other, in travelling.

(*c*) Special care must be taken to pack Oil Paintings in cases, and they should be protected by corks fastened at their corners, or by other efficient means, so that no other works may be in contact with their surfaces. No work which is not thoroughly dry should be sent up. Oil Paintings should never be sent between boards.

(*d*) To ensure greater safety in transit, casts, models, and specimens in materials of a fragile character should be first carefully packed separately in light boxes, and these packages then put into an ordinary packing case, care being taken to put enough straw or wood wool, not sawdust, around each package to prevent its shaking inside the outer packing case during transmission.

(*e*) Small objects, such as enamelled buttons, should be placed in small boxes or envelopes, and not be packed loose in the case.

(*f*). Instructions as to the address to which the works are to be forwarded, will be issued later.

(*g*) The Board will only pay for the carriage of works if they are sent by Goods Trains, *or, in the case of Schools situated near the Board's offices, by van or carrier.*

11. The Board do not hold themselves responsible for any loss or damage which may occur to the works. All reasonable care will be taken of them while they are in the custody of the Board.

Awards.

12. The awards for the best works in the National Competition are about 12 Gold, 60 Silver, and 200 Bronze Medals, and a limited number of Book Prizes and Commendations. The number of awards may be increased or decreased according to the merit of the works submitted.

13. The Gold Medals are usually awarded in the following Subjects :—

(*a*) Drawing from a single antique statue. (Subject 8*b*[2].)

(*b*) Drawing from the nude living model, without a background. (Subject 8*c*[2].)

(*c*) Time sketches of the human figure from the nude. (Subject 8*e*.)

(*d*) Painting the human figure from a single antique statue. (Subject 16*a*.)

(*e*) Painting the nude figure from nature. (Subject 17*c*.)

(*f*) Modelled, carved, or wrought studies of the human figure from a single antique statue. (Subject 19*b*[2].)

(*g*) Modelled, carved, or wrought studies of the human figure from the nude living model. (Subject 19*e*.)

(*h*) Designs for Weaving, Embroidery, Tiles, Mosaics, Iron Work, Goldsmiths' Work, Wall Papers, Printed Textiles, Architectural Work, and Decorative Work; Ornamental Studies; and Modelled Designs of various kinds, &c. (Subjects 23 and 24.)

14.—(*a*) A Competitor who in respect of different subjects is awarded more than one Medal of the same class in the same year or in succeeding years, receives books, &c., instead of a second Medal.

(*b*) Where a Competitor obtains two or more awards in the same year for works in the same subject, he will receive a prize in respect of only one of the awards. Certificates will be issued in lieu of the other awards.

(*c*) The award of a Gold, Silver, or Bronze Medal or a Book Prize may be made to a Competitor once in each of the Subjects 23 (*a*) to 23 (*h*) inclusive, or alternatively for work in Design of a similar character executed in material and submitted under Subject 24.

(*d*) A Competitor awarded a Medal or Prize in a subject for which he has previously been awarded a Medal or Prize of the same or a higher class, will not receive the Medal or Prize, but will be given a Certificate recording his success. In the case of Subject 24 this applies also where the Subject of the award is not the same as that of the previous award, but is similar to it.

15. The Managers of a School or Class must undertake to make arrangements for obtaining the prizes of books, instruments, &c., which are to be given to the students entitled to receive them. The first award of a Medal, whether Gold, Silver, or Bronze, carries with it books to the value of 1*l.* to accompany the Medal. Students entitled to receive Medals may, if they prefer it, receive instead books, &c., of the value shown below :—

	£
Instead of Gold Medal - - -	- 10
„ „ Silver „ - - -	- 4
„ „ Bronze „ - - -	- 2

The value of a Book Prize is 1*l.*

Exhibition of Works.

16. A selection of the works gaining Medals and Prizes at the National Competition of 1914 will be exhibited in London probably in August.

17. Particulars of grants which may be made to enable a limited number of teachers and students of Schools of Art and Art Classes to visit London to see the exhibition of selected works and for other purposes, will be found in paragraph 28 of the Interim Regulations for awards in Art, 1914.

L. A. Selby-Bigge

22*nd October*, 1913.

Appendix.

Classification of Subjects for the National Competition.

Subject 8. DRAWING THE HUMAN FIGURE, OR ANIMAL FORMS, FROM THE "ROUND" OR FROM NATURE.

b[1]. Shaded (details).
b[2]. Shaded (whole figures).
c[1]. Studies of heads, hands, and feet from life.
c[2]. Studies of the human figure from nude model.
d. Studies of drapery arranged on figure from antique or on the living model.
e. Time sketching.
f. Sketching from memory.

Subject 9. ANATOMICAL STUDIES OF THE HUMAN FIGURE OR OF ANIMAL FORMS.

a. Students' own setting of bones and muscles drawn or painted within the outline of a figure.
b[1]. Drawn or painted from the skeleton or anatomical figure.
b[2]. Drawn or painted from copies.
c. Students' own setting of bones and muscles, modelled.
d[1]. Modelled from the skeleton or anatomical figure.
d[2]. Modelled from the flat.

Subject 10. DRAWING FLOWERS, FOLIAGE, LANDSCAPE DETAILS, AND OBJECTS OF NATURAL HISTORY, FROM NATURE.

a. In outline.
b. Shaded.
c. In monochrome.

Subject 12. PAINTING ORNAMENT FROM THE CAST, &C.

a. In monochrome either in water-colour, oil, or tempera.

Subject 14. PAINTING DIRECT FROM NATURE.

a. Flowers, or still-life, in water-colour, oil, or tempera, without backgrounds.
b. Views of buildings.
c. Drapery.

Subject 15. PAINTING (FROM NATURE) GROUPS OF STILL-LIFE, FLOWERS, &C. AS COMPOSITIONS OF COLOUR.

a. In oil colour.
b. In water-colour or tempera.

Subject 16. PAINTING THE HUMAN FIGURE OR ANIMALS IN MONOCHROME FROM CASTS.

a. In oil, water-colour, or tempera.

Subject 17. PAINTING THE HUMAN FIGURE OR ANIMALS.

b. The head or draped figure from nature.
c. The nude figure from nature.

Subject 18. MODELLED, CARVED OR WROUGHT STUDIES OF ORNAMENT.

b. From casts of ornamental compositions for pilasters, friezes, &c.
c. From drawings or photographs.

Subject 19. MODELLED, CARVED OR WROUGHT STUDIES OF THE HUMAN FIGURE OR ANIMALS.

a. Hands and feet from casts.
b[1]. Heads and masks from casts, in the round, or from casts in relief.
i. Heads and masks in relief from casts in the round.
b[2]. Whole figures from casts of the figure in the round, or from casts of the figure in relief.
k. Whole figures in relief from casts of the figure in the round.
c. Modelling the figure or animal forms from the flat.
d. Heads, hands, and feet from nature in the round.
l. „ „ „ in relief.
e. The human figure from the nude model in the round.
h. „ „ „ in relief.
f. Modelling drapery from actual stuffs and not from casts.

Subject 20. MODELLED, CARVED OR WROUGHT STUDIES OF FRUITS, FLOWERS, OR FOLIAGE, AND OBJECTS OF NATURAL HISTORY, FROM NATURE.

Subject 22. ELEMENTARY DESIGN.

a. Studies treating natural objects ornamentally.
b. Ornamental arrangements to fill given spaces in outline, monochrome or modelled.
d. Studies of historic styles of ornament drawn or modelled.
e. Studies in lettering.

Subject 23. DRAWINGS FROM ACTUAL MEASUREMENTS OF STRUCTURES, MACHINES, &C., APPLIED DESIGNS, TECHNICAL, OR MISCELLANEOUS STUDIES.

a. Architecture and building construction—drawings from actual measurements, taken by the students, of existing structures.
b. Architecture and building construction—original designs.
c. Ornamental design as applied to decorative or industrial art.
d. Figure composition, and ornamental design with figures, as applied to decorative or industrial art.
e. and *f*. The same as 23*c* and 23*d*, but in relief.
g. Machine construction and naval architecture—drawings from actual measurements, taken by the student, of existing machines, ships, &c.
h. Machine construction and naval architecture—original designs.

Subject 24. WORK DESIGNED AND EXECUTED IN MATERIAL WHOLLY BY THE STUDENT.

a. Complete objects or articles.
b. Portions of objects or articles.
c. Surface decoration of objects or articles.

In the case of works under (*b*) and (*c*) a clear statement must be attached to each work, indicating the extent of the portion actually designed and worked in material by the student.

N.B.—Sets of three studies of plant form, and sets comprising studies in colour of growing plants, together with three designs based thereon, such as were formerly required for the Art Class Teacher's Certificate may be classified under Subject 10 *and Subject* 22 *respectively.*

FOR OFFICIAL USE.

Rules 104.

BOARD OF EDUCATION.

REGULATIONS AND SYLLABUSES FOR EXAMINATIONS IN SCIENCE AND TECHNOLOGY, 1914.

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CONTENTS.

O (11)18830 Wt 16978—74 11250 11/13 E & S **(Sch C 26)** A 2

Syllabuses upon which Competitive Examinations for Awards in Science, but not General Examinations, will be held in 1914.

Prefatory Note.

This volume of Regulations for Examinations in Science and Technology, 1914, contains the subject matter of regulations corresponding to the separate publications described as Regulations and Syllabuses for the Examinations in Science and Technology to be held in the year 1913, and Regulations for the Local Management and Conduct of Examinations in Science and Technology, 1913 (Rules 104).

The Regulations as to the subjects of the Examinations, as to the eligibility of candidates to be admitted to the General Examinations, and as to fees, result lists, certificates, &c., are given in the first ten sections, and in sections 11–28 a statement of the local arrangements which must be made where the examinations are desired. No material alteration has been made, except that the submission of Drawings as testimonies of study by competitors for Scholarships, &c., taking the Higher Examinations in Machine Construction and Drawing, Building Construction, or Naval Architecture, will no longer be required.

The Syllabuses printed after the Regulations in this volume are those upon which the Examinations in subjects of Science and Technology to be held by the Board in 1914 will be based. It was announced in paragraph 14 of the Appendix to Circular 776 that the Examinations to be held in 1913 for the purpose of determining the awards in Science, namely, Royal Scholarships and Free Studentships and Sir Joseph Whitworth's Scholarships and Exhibitions, would be of standards corresponding to those of the reorganised General Examinations, and that, so far as provision was not made by that system for Examinations in all the subjects prescribed in the Regulations for these awards, special Examinations, of standards corresponding to those of the General Examinations, would be held. It has been decided to continue this arrangement for 1914.

The Syllabuses thus fall into two groups. The first group includes the Syllabuses of subjects in which the Board hold General Examinations. As the various subjects which may be offered by competitors for awards in Science include all the subjects, except Coal Mining, in which General Examinations are held, these Syllabuses, with the exception named, will also serve for the purposes of the competitions. The second group includes the Syllabuses of subjects which may be offered by competitors for awards in Science but in which there is no General Examination. Examinations in these subjects will be held for competitors for awards and for no other candidates. In each of the

subjects for which a Syllabus is given, except General Biology and Freehand Drawing, a Lower and a Higher Examination will be held; in each of the two subjects just mentioned there will be only one Examination. In accordance with the announcement already made in a note to the Syllabus for 1913, the Examinations in Sound and Light will in 1914 be combined. One Lower paper and one Higher paper will be set in the combined subject.

The Time Tables of the Examinations to be held in 1914, with certain instructions for the information of candidates, are printed at the end of this volume.

L. A. Selby-Bigge

29th October, 1913.

N.B.—New or substantially modified passages are printed in italics.

REGULATIONS FOR EXAMINATIONS IN SCIENCE AND TECHNOLOGY, 1914.

General Examinations in Science and Technology.

1.—(*a*) General Examinations in Science and Technology will be held in 1914 in the subjects stated below. The Examinations in the several subjects are separate and independent, but the subjects are grouped* for the purpose of constituting Examining Committees dealing with related subjects.

Group A.—Pure and Applied Mathematics.

1. Practical Geometry and Graphics.
2. Pure Mathematics.
3. Practical Mathematics.
4. Theoretical Mechanics (Solids).
5. Theoretical Mechanics (Fluids).

Group B.—Engineering.

6. Machine Construction and Drawing.
7. Applied Mechanics (Materials and Structures).
8. Applied Mechanics (Machines and Hydraulics).
9. Heat Engines.
10. Building Construction.
11. Naval Architecture.

Group C.—Physics.

12. Heat.
13. Magnetism and Electricity.

Group D.—Chemistry.

14. Inorganic Chemistry.
15. Organic Chemistry.

Group E.—Coal Mining and Metallurgy.

16. Coal Mining.
17. Metallurgy.

(*b*) In each subject there is a Lower Examination and a Higher Examination.

* This grouping has no connection with the grouping of subjects for the purposes of the Competitions for Royal Scholarships and Free Studentships in Science.

1—*cont.*

(*c*) The Examinations will be based upon the Syllabuses which follow these Regulations (*see* pages 13 to 54).

(*d*) The Time Table of these Examinations, with certain instructions relating to them, is printed on pages 81 to 83. This Time Table has already been separately issued (Form 600 T).

Qualifying Test for admission to the Competition for Royal Scholarships, &c.

2.—(*a*) In the following subjects—

English,
Mathematics,
Mechanics (Solids and Fluids),
Chemistry,
Sound, Light and Heat,
Magnetism and Electricity,
Freehand Drawing,

it may be necessary to hold Qualifying Examinations for intending competitors for Royal Scholarships and Free Studentships. (*See* paragraphs 4 and 6 of the Regulations for Scholarships, Exhibitions, &c., in Science, 1914.) The Time Table of these Examinations, with certain instructions relating to them, is printed on page 81.

(*b*) The Qualifying Examinations so far as they may be required will be held under the special arrangements detailed in paragraph 11.

Competitive Examinations for Royal Scholarships, &c.

3.—(*a*) For the purpose of determining the awards of Royal Scholarships and Free Studentships in Science and Sir Joseph Whitworth's Scholarships and Exhibitions, Competitive Examinations will be held, so far as may be required, in the subjects (except Coal Mining) in which General Examinations are held, and in the following subjects in which no General Examinations are held :—

Sound and Light.
Practical Inorganic Chemistry.
Practical Organic Chemistry.
Practical Metallurgy.
General Biology.
Human Physiology.
Zoology.
Botany.
Geology.
Mineralogy.
Freehand Drawing.

3—*cont.*

(*b*) A competitor who offers a subject in which a General Examination is also held will take a paper identical with that set for the Lower or Higher General Examinations, as the case may be. In the subjects enumerated in (*a*) above there will be a Lower Examination and a Higher Examination, except in the case of General Biology and Freehand Drawing, in each of which subjects one Examination only will be held. The Syllabuses upon which the Examinations will be based are those contained in this volume.

(*c*) Competitors for Royal Scholarships, Free Studentships (Science), Whitworth Scholarships or Exhibitions, or Local Science Exhibitions, who take the Higher Examinations for the purposes of the Competitions will be required, in all subjects except Practical Geometry and Graphics, Pure Mathematics, Practical Mathematics, Theoretical Mechanics (Solids and Fluids), Machine Construction and Drawing, Building Construction and Naval Architecture, to submit their laboratory note-books, signed and certified by their teachers, for inspection.

(*d*) The Time Table of these Examinations, with certain instructions relating to them, is printed on pages 83 to 85.

4. Reference should be made to the separately published "Regulations for Scholarships, Exhibitions, &c., in Science for the year 1914," and to the "Prospectus of Sir Joseph "Whitworth's Scholarships and Exhibitions for Mechanical "Science (42nd edition)," for particulars of the Competitions and for a statement of the conditions under which candidates are admitted to them.

Regulations applicable only to the General Examinations.

5. The following Regulations as to the eligibility of candidates for admission to the Examinations, fees, result lists, certificates, &c., are applicable only to the General Examinations, and, except in the cases specially provided for, do not affect candidates who are only taking the subjects of a General Examination as competitors for a Scholarship or other award in Science.

6.—(*a*) The General Examinations in Science and Technology are intended for Students who have been registered during the school year in which the Examinations fall in Part-Time or Short Full-Time Courses recognised under the Board's Regulations for Technical Schools, &c.

(*b*) Students may not attend these Examinations, except with the express approval of the Board obtained beforehand, if they have been registered during the school or academic year in which the Examination falls in Full-Time Courses

6.—(*b*)—*cont.*

covering more than a year at an Institution recognised under the Board's Regulations for Technical Schools, &c., or in any Courses recognised under the Statement of Grants available in aid of Technological or Professional work in Universities, or in other University Degree or Diploma Courses.

(*c*) Other persons, if eligible under the conditions stated below, will be accepted as candidates at the General Examinations, provided that in the case of Pupil-Teachers, Pupils in Preparatory Classes, Student-Teachers, Students in Training as intending Teachers in Elementary Schools, and Students in Training as intending Teachers of Domestic subjects, the express approval of the Board has been obtained beforehand.

7. No candidate will be eligible for admission to the General Examinations in 1914 who will not be over 17 years of age on the 31st July 1914.*

8.—(*a*) A fee of 3*s.* 6*d.* is payable for each examination applied for in each stage of each subject.

(*b*) A competitor for an award under the Regulations for Scholarships, &c., in Science, 1914, who offers in the Competition a subject in which a General Examination is held will not be accepted also as a candidate in the General Examination in the subject unless he satisfies all the conditions, including the payment of the fee of 3*s.* 6*d.*

9. Candidates taking the Higher Examinations in any of the following subjects, viz. :—

Applied Mechanics (Materials and Structures),
Applied Mechanics (Machines and Hydraulics),
Heat Engines,
Heat,
Magnetism and Electricity,
Inorganic Chemistry,
Organic Chemistry,
Metallurgy,

will be required to furnish a certificate of having completed a satisfactory amount of laboratory work, and to submit for inspection his laboratory note-books, signed and certified by the teacher: *account will be taken of these in determining the results of the examinations.*

10.—(*a*) The Board will issue Result Lists of the Examinations. There will be no classification of the successful candidates in the Lower Examinations, but candi-

* *For the purpose of these Regulations a person is considered to complete each year of age immediately on the commencement of a birthday. Thus a person born on July 31st, 1897, is over 17 years of age on July 31st, 1914, and is qualified, therefore, for admission to the Examination; but, a person born on August 1st, 1897, is not.*

10.—(*a*)—*cont.*
dates who are successful in a Higher Examination will be classed as (i) having passed the Examination, or (ii) having passed the Examination with distinction.

(*b*) No result will be announced for a competitor who takes a Scholarship Examination identical with a Lower or Higher General Examination unless he has satisfied all the conditions of admission to the General Examination, including the payment of the fee of 3*s.* 6*d.*

(*c*) Candidates who pass the Lower Examination in Coal Mining in 1914 will receive Certificates, but no Certificates will be issued to candidates who pass the Lower Examination in other subjects. Candidates who pass the Higher Examinations held in 1914 will receive Certificates. These arrangements will not necessarily apply after 1914.

(*d*) Except as provided in the Regulations for Scholarships, &c., in Science, 1914, the General Examinations will only be available for the determination of the awards of Scholarships, Prizes, &c., if the following conditions are satisfied:—

(i) The scheme of the Competition must be submitted to the Board not later than the 1st of May and must be approved by them.

(ii) The promoters of the Competition must undertake to meet the expenses of a special revision of the exercises worked in the Competition.

(iii) The scheme must not provide for the determination of the awards partly upon the work done by the competitors at the Board's Examinations in Science and Technology and partly upon their work at other Examinations.

(iv) No information can be furnished by the Board other than the statement of the order or orders of merit in which the candidates are placed after such revision of their exercises worked at the Board's Examinations as may be necessary. In no circumstances can the marks obtained by candidates, or any information as to their marks, be communicated.

Special Arrangements as to Qualifying Test and Examination in Freehand Drawing.

11.—(*a*) As soon as possible after the receipt of the forms of application for admission to the competitions for Royal Scholarships and Free Studentships in Science, the Board will inform applicants whether they are required to undergo a qualifying test, and, if so, in what subject or subjects,

11.—(*a*)—*cont.*

and, further, as to the arrangements which the Managers or Local Education Authority, as may be most convenient, are prepared to make for the holding of the requisite test which will take place from the 2nd to the 10th of March.

(*b*) Arrangements similar to those mentioned in the previous paragraph will apply to those competitors for the Whitworth Scholarships and Exhibitions who indicate on their forms of application for admission to the Competition that they desire to take the Examination in Freehand Drawing to be held on the 2nd March, and the Examinations in Theoretical Mechanics to be held on the 4th and 5th of March.

(*c*) The Board will communicate with the Managers or the Local Education Authority as may be convenient as to the holding of these Examinations where they appear to be required.

Local Management of General and Competitive Scholarship Examinations.

12. The General Examinations in Science and Technology, and the Competitive Examinations for Scholarships, &c. (except the Freehand Drawing Examination in the Whitworth Competition) will, as regards local management, be held under the following Rules.

13. For the local management of the Examinations mentioned in Rule 12 the Board recognise either—

(*a*) The Local Education Authority for Higher Education, who, subject to these Rules, may appoint a Special Local Secretary to undertake the arrangements for the Examinations; or

(*b*) Managers of Schools or Classes.

Special Local Secretaries and Assistants.

14.—(*a*) Where numerous Examinations have to be held and the number of papers to be applied for is considerable, the Board may approve the appointment of a Special Local Secretary to undertake the arrangements for the Examinations.

(*b*) *Application for approval of the appointment of a Special Local Secretary must be made to the Board by the Local Education Authority by letter not later than the* 31*st January, and in cases in which the application is granted the name of the person they propose to appoint must be submitted to the Board for approval not later than the* 14*th February.*

14—*cont.*

(*c*) Assistants may be appointed by the Local Education Authority to act as Superintendents at the Examinations. The names of the persons proposed for appointment as Assistants must be submitted for the Board's approval, with such information as the Board may require for the purpose of satisfying themselves that such persons are qualified by their position or occupation to perform the duties of this office satisfactorily.

(*d*) Candidates for Examinations, their relatives, their teachers, or other persons who have a direct interest in the success of a candidate, are ineligible to act as Special Local Secretaries or Assistants for the district in which the candidates are to be examined.

(*e*) After a Special Local Secretary has been appointed, the Board will, as a rule, correspond with him alone on all subjects connected with the Examinations. He must arrange for holding the Examinations at convenient Centres, subject to the approval of the Board, the number of these Centres being as few as possible. As he is charged with the general supervision of the Examinations, he may not, except in an emergency, act in the place of an Assistant on any occasion on which there is an Examination at more than one Centre.

(*f*) The Special Local Secretary must forward to the Board, not later than the 1*st of April*, his proposed arrangements for the Examinations, with a requisition for papers, together with the necessary fees. The Special Local Secretary should refuse to provide accommodation for any candidate in respect of whom application has not been made by the prescribed dates (*see* Rules 18 (*a*) and 20 (*a*)).

15.—(*a*) The Special Local Secretary will be entitled to payment for the services of himself and the Assistants from a fund to which the Board will contribute after receiving a certificate on the prescribed form. This contribution will be one-half the total sum payable at the rates set out below to the Special Local Secretary and the Assistants necessarily employed under Rules 24, 25, and 26, or two shillings and sixpence for each exercise worked at the Examinations, whichever is the less.

(*b*) The financial arrangements of the Examinations are, subject to the Regulations of the Board, entirely under the control of the Local Education Authority, to which body the Special Local Secretary is required to submit his accounts. Each School having students for examination may be required, if the Local Education Authority think fit, to pay a contribution prior to the time of the Examination; the students

15.—(*b*)—*cont.*
of any School from which such contribution has been so required, but has not been received, may be excluded from the Examination. The Special Local Secretary shall account to the Authority for any payments received from the Schools, or from candidates (*see* Rule 20 (*c*)). Any such payments must be applied towards providing the amount required from the locality for examination expenses to meet the grant given by the Board.

(*c*) The Special Local Secretary is allowed a fee of half a guinea for each afternoon or evening on which an Examination is held in his district, and is also allowed a fee of half a guinea for every 75 exercises worked at the Examinations. When he acts in place of an Assistant he will receive no additional fee for so acting.

(*d*) For attendance throughout an Examination not exceeding four hours, each Assistant is allowed a fee of half a guinea. Where that period is exceeded, an additional fee of three shillings and sixpence for each additional hour or fraction of an hour is allowed up to a maximum total fee of one guinea.

Managers of Schools and Classes.

16.—(*a*) Where no Special Local Secretary is appointed, the management of Examinations devolves upon the Managers of the School or Class requiring Examination, and the Board will recognise their Correspondent as Examination Secretary. The Examinations must be superintended by persons approved by the Board for the purpose. Candidates for examination, their relatives, their teachers, or other persons who have a direct interest in the success of a candidate, are ineligible to act as Examination Secretaries or Superintendents of Examinations.

(*b*) Where two or more Schools or Classes, within reasonable distance of one another, require simultaneous examination, the Board may call upon their Managers to appoint one of themselves as the Examination Secretary, and he must make arrangements for the Examination in question to be held at a common centre.

(*c*) Except as provided by Rule 17, no payment is made by the Board in aid of the management or conduct of any Examination to which this Rule applies.

Special Paid Superintendents.

17.—(*a*) Subject to the provisions of this Rule, the Board may recognise as Special Paid Superintendents approved persons appointed by the Local Education

17.—(*a*)—*cont.*
Authority to superintend Examinations for which no Special Local Secretary is appointed.

(*b*) Special Paid Superintendents will be entitled to payment at the rates allowed for Assistants to Special Local Secretaries, and will be subject to the Rules for such Assistants. A contribution will be made by the Board in these cases under the conditions laid down in Rule 15 so far as applicable.

Application for Examination Papers and Payment of Fees.

18.—(*a*) Managers must apply on the prescribed form and not later than the *25th of March*, for Examination Papers. This application must be made to the Special Local Secretary, where one has been appointed, and in other cases to the Board.

(*b*) Managers are responsible for satisfying themselves that each person in respect of whom General Examination Papers are applied for is eligible under the Regulations for such Examinations.

(*c*) The application for Scholarship Examination Papers, if any are required, must be made at the same time and must relate only to persons who are competitors for an Award under the Regulations for Scholarships, Exhibitions, &c. in Science, 1914.

(*d*) The Board cannot undertake to entertain late or irregular applications.

(*e*) The application for papers must be accompanied by a remittance covering the amount of fees payable to the Board, viz. :—

3*s.* 6*d.* for each Examination applied for on behalf of each candidate at the General Examinations in Science and Technology.

(*f*) No fees are payable to the Board in respect of papers applied for on behalf of a registered competitor for an award under the Regulations for Scholarships, &c. in Science, 1914, except in so far as the competitor—

(i) takes subjects in which a General Examination is held ; and
(ii) is a candidate at the General Examination in one or more of those subjects.

19. Where application is made for the examination of less than four candidates in one place, the Board may require the candidates to go to a neighbouring centre.

Admission of Candidates and Local Charges.

20. When it has been arranged to hold an Examination persons eligible to attend it are entitled to be admitted, subject to the following conditions, and provided there is accommodation available :—

(*a*) Applications made later than the 21*st March* may be rejected.

(*b*) The applicant must satisfy the Special Local Secretary or the Managers that he is eligible to attend the General Examinations or that he offers the subject of the Examination as a competitor for an Award under the Regulations for Scholarships, Exhibitions, &c. in Science, 1914.

(*c*) If the Local Education Authority think fit in the case of an Examination for which a Special Local Secretary or a Special Paid Superintendent has been appointed, or if the Managers think fit in other cases, the applicant may be required, in addition to paying any Examination fee payable to the Board, to contribute towards the local expenses of the Examination.

(*d*) The contribution required may not exceed 5*s.* if the Examination is in Practical Chemistry or Practical Metallurgy, and may not exceed 2*s.* 6*d.* in other cases.

Submission of Certificates of Laboratory Work and Note-books.

21. Arrangements must be made by Special Local Secretaries or Managers for the collection and submission in accordance with instructions which will be given in due course of the testimonies of study (certificates of laboratory work and laboratory note-books) required to be furnished by candidates in certain subjects of the Higher Examinations under paragraphs 3 (*c*) and 9 of these Regulations.

Examination Arrangements.

22.—(*a*) The Examination Papers will be forwarded to the Special Local Secretary, or to the Examination Secretary, as the case may be, who will be responsible for their safe custody and distribution. The packets of Examination Papers must not in any circumstances be permitted to pass

22.—(*a*)—*cont.*
into the hands of a teacher, or of a candidate for examination, or of any other person interested in the success of a candidate.

(*b*) All possible care is taken to forward the Examination Papers in accordance with the applications, but the Board cannot undertake to rectify mistakes for which the Board are not responsible.

23.—(*a*) Examinations should only be held in rooms which are adequately lighted. The rooms should have level floors and be without galleries, and should as a rule be such as to accommodate candidates so that they may be seated not less than 5 feet apart from centre to centre.

(*b*) Examinations in Practical Chemistry (Inorganic and Organic) and in Practical Metallurgy may be held only in laboratories approved by the Board.

24. For each room in which an Examination is held provision of Superintendents must be made on the following scale :—

30 candidates or less - One Superintendent.
31 to 70 candidates - Two Superintendents.
71 or more candidates - Three Superintendents.

25. For Examinations in Practical Chemistry or Practical Metallurgy there must be two Superintendents for 30 candidates or any smaller number.

26. Where a large room is divided by partitions, each separate section must be treated as a separate room. An additional Superintendent must be provided in any L-shaped or T-shaped room.

27. Detailed Instructions for the superintendence of Examinations will be issued in due course to Special Local Secretaries and to Managers who have applied for Examinations.

28.—(*a*) The Board, after such investigation as they may think necessary, may cancel the examination of all or any of the candidates, in cases where there is evidence of fraud or where there has been such breach of the Instructions as, in their opinion, may be sufficiently serious to invalidate the Examination, or, alternatively may require all or any of the candidates to be re-examined. If any candidate should fail to appear at an investigation, or decline to be re-examined,

28.—(*a*)—*cont.*

the Board may refuse to announce any results in respect of the Examinations taken by him in the same year.

(*b*) The Board may make it a condition of any special examination they consent to hold where there has been failure to hold an examination through no fault of the Board that the whole cost incurred is met locally.

SYLLABUSES UPON WHICH GENERAL EXAMINATIONS IN SCIENCE AND TECHNOLOGY AND COMPETITIVE EXAMINATIONS FOR AWARDS IN SCIENCE WILL BE HELD IN 1914.

(N.B.—In Coal Mining General Examinations only are held.)

GROUP A.—PURE AND APPLIED MATHEMATICS.

SUBJECT 1.—PRACTICAL GEOMETRY AND GRAPHICS.

This subject (formerly known as Practical Plane and Solid Geometry) comprises the graphical representation of position and form and the graphical solution of problems.

Throughout the course there should be applications of geometry to problems which arise in connection with the Building and Engineering trades and the Physical Sciences. It is not expected, however, that Building Construction students, for example, should show very much interest in portions of the subject such as the Geometry of the motions of machines, or some parts of Vector Geometry, which are very important for Mechanical Engineers; on the other hand the latter have not much concern with many parts of Solid Geometry. In order to meet these various conditions, a large choice of questions will be provided, which, including those of a general character, will enable the examination to be taken by students who are devoting themselves more especially to that subject-matter which has a particular bearing upon their own industry. It should be understood that it is better to confine attention to a portion of the subject, and study this thoroughly, than to range over the whole ground in a perfunctory manner.

Much lecturing is to be avoided. Students ought to be educated mainly through their own work. A large part of this work should be quantitative, and it is important that from the beginning, and throughout the entire course, careful draughtsmanship, and the use of properly adjusted instruments, be insisted on. All constructions should be drawn with hard and finely-sharpened pencils, and left without being inked in. Careless work, or work done with soft or blunt pencils, will be discredited in the examination.

Any method of working which commends itself in enforcing a geometrical truth may be employed. Thus graphical constructions may be supplemented by arithmetic when comparing quantitative results. Tracing paper will be found useful when applying the method of superposition, or plotting a locus, finding the length of a curve, &c. Squared tracing paper will sometimes prove helpful. Models should be freely used, especially in Solid Geometry.

Deductive reasoning and generalisations may be introduced from time to time as the student becomes fitted for them, and when any portions of the subject specially require them. Teachers should develop and illustrate the subject in the way best suited to the local circumstances.

Candidates should bring with them to the examination a drawing board (22 inches by 15 inches), tee square, set square, lead pencils, drawing pins, compasses, protractor, and decimal scales in which the main divisions are inch, half inch, quarter inch, one-eighth inch, and one centimetre long; also inch scales subdivided into eighths and twelfths.

Drawing paper, pens, and ink will be provided, as will also the necessary Tables,* and candidates will be restricted to the use of these Tables, and will not be allowed to bring with them into the examination room any other Mathematical or Logarithm Tables. The use of slide rules is permitted.

Compulsory questions may be set at the examinations.

Lower Examination.

Plane Geometry.

The construction and use of scales.

The plotting and measurement of angles in degrees and radians by the use of protractor, scale of chords, trigonometric tables or tracing paper.

The division of lines into parts in given proportions, and other illustrations of the propositions of the sixth book of Euclid. Third and fourth proportionals.

The location of points by rectangular and radial co-ordinates, and by triangulation. The construction of any polygon from adequate data. Similar figures. Enlarging and reducing figures by radial projection and by the method of squares.

Verification of the propositions of Euclid III., 34, 35, 36. Applications, including constructions for finding a mean proportional.

Areas of triangles, polygons, and curved figures. The circumference and area of a circle determined experimentally.

The construction of circles from specified data. Tangents. Angles in a segment. Applications to problems in surveying.

Regular polygons. Examples of inscribed and circumscribed figures, with applications to geometrical patterns, and window tracery. Mouldings.

The ellipse, hyperbola and parabola, with their tangents and normals.

Examples of geometrical loci, tracing paper being employed whenever convenient. The setting out of linkwork; the tracing of point paths in mechanisms.

Constructions relating to simple harmonic motions or harmonic functions. What is meant by periodic time, frequency, amplitude, phase, epoch, representative crank, advance, lag, lead. Interpretation of the expression $x = a \sin (qt + a)$ or $= a \sin (\theta + a)$. Plotting the curve of sines from given data. Combinations of simple harmonic motions.

Miscellaneous problems and applications of geometrical principles.

Vector Geometry.—Vector summation applied to forces acting at a point. Experimental verification of the triangle and polygon of forces by means of spring balances, or cords, pulleys, and weights, combined with graphical construction.

Every candidate should have an opportunity of actually making these experiments himself and not of merely seeing the teacher or someone else make them.

Meaning of the symbols $+$, $-$, $=$, when applied to vectors. Meaning of such expressions as $A = a_a = 21_{55°}$, $A + B$, $A - B$, $a_\alpha + b_\beta - c_\gamma$, $2 \cdot 4_{30°} + 1 \cdot 7_{180°} - 3 \cdot 5_{271°} = a_a = A$. Verification by drawing of the bracket law as expressed by the equation $A - (B - C) = A - B + C$. Vector subtraction applied to relative positions, displacements and velocities. Meaning of the scalar product of two vectors, with illustrations. Momentum and change of momentum, with applications.

Force in a plane defined by the statement of a length, a magnitude, and an angle.

Let OX be a fixed line in the plane, O a fixed point in OX. Let the line of any force A (magnitude a) cut OX in I. Let x be the length of the intercept OI. Let α be the angle measured anti-clockwise, which the force, supposed to act outwards from I, makes with OX. Then $A = {}_x a_\alpha$ defines the force.

* "Mathematical Tables" published by the Board. Price 1*d*.

The link polygon. Experimental illustration by means of spring balances, or pulleys, cords, and weights; verification by drawing of the relations which exist between the forces, the form taken by the cord, and the tensions in the segments of the cord. Conditions of equilibrium of a set of forces in one plane (the force polygon and the link polygon must be closed). Applications. Force diagrams for roof trusses and other braced frames.

Moments of forces. Couples. Experimental verification of the principle of moments.

Students of building construction may omit most of this work on vectors.

Solid Geometry.

Various methods of defining the positions in space of points, lines, and planes, including the method of figured plans. Horizontal and vertical traces. Inclinations of lines and planes to the planes of projection.

General problems on lines and planes, with applications. Their intersections; the angles between them; parallel and perpendicular lines and planes. Auxiliary plans and elevations. Rabattements.

Problems on trihedral angles and spherical triangles, with applications.

Prisms and pyramids, the regular tetrahedron and octahedron, the sphere, the right circular cylinder and cone; other objects. Plans, elevations, and sections of these solids singly or in combination. Interpenetrations and developments.

Metric or parallel pictorial projections, applying the principle that parallel lines project into parallel lines, and to the same scale.

Applications of the preceding problems in solid geometry requiring quantitative measurements.

N.B.—Some of the problems in solid geometry occur in connection with simple roofs, hipped roofs, intersecting roofs, roofs of bay windows, trimming roofs for chimneys, finding lengths of rafters and bevels for hip and jack rafters and purlins; hand railing, the development of the rail on a quarter space landing, determination of hand-rail bevels, development of strings for stairs, falling and face moulds for hand railing. Plans, elevations, and sections of simple masonry domes, circular in plan, showing the joints; plans, elevations, and sections of stone and brick niches, showing joints, &c. Sloping ground, embankments; joints in woodwork.

During the course of study opportunities will occur from time to time of explaining the nomenclature of the subject, and what is meant by projection, the angle between a line and plane, or between two planes, &c.

Higher Examination.

Candidates must have an intimate acquaintance with the portions of the subject enumerated in the Syllabus for the Lower Examination. Questions in the following portions of the subject may also be set:—

Plane Geometry.

The construction of conic sections from adequate data. Archimedian, logarithmic and other spirals. Scrolls and volutes. Involutes and evolutes. Mouldings. Applications of geometry to Architecture.

N.B.—The succeeding portions of Plane Geometry need not be regarded as essential for those students whose work has special relation to the Building Trades.

Geometry of the curves $y = a + bx^n$ and $y = a + be^x$, with applications.

Roulettes. Envelopes. Curvature. Wheel teeth. Cam profiles.

The successive integration and differentiation of curves and diagrams, with applications.

Vector Geometry.—Further applications of the link polygon. Determination of centre of gravity, moment of inertia, and radius of gyration. Diagrams of shearing force and bending moment for beams transversely loaded. The loaded flexible cord and the linear arch. Masonry arches. The three hinged arched rib; diagrams of thrust, shearing force and bending moment. Braced frames in three dimensions. Deflections of braced frames. *Wind forces on aerofoils.*

Motions of fluids over fixed or moving vanes, with applications to turbines and centrifugal pumps.

The hodograph. Velocity and acceleration images. Rotation vectors. Harmonic analysis. Applications to problems on balancing; to plane motions of machines; and to electrical problems.

Solid Geometry.

(N.B.—Students whose work has special relation to engineering trades will not, as a rule, find it necessary to do so much work in Solid Geometry as those who are concerned with problems arising in Building Construction.)

General problems on the point, line and plane.

Projections and sections of the geometrical solids enumerated in the Syllabus for the Lower Examination, together with regular and irregular polyhedra; oblique cones and cylinders; solids of revolution, including the annulus; helical surfaces, including screw threads, spiral springs, and propeller blades. The ellipsoid, hyperboloid and paraboloid. Curves and surfaces generated by the motions of points and lines in space. Tortuous curves.

Tangent planes and tangent surfaces. Interpenetrations. Developments, including approximate developments of twisted surfaces, with applications to sheet metal work.

Cast shadows, with parallel or divergent rays. Simple examples of perspective projection.

The use of contours in problems relating to irregularly curved surfaces, such as those of earthworks, ships, &c. Areas of surfaces and volumes of solids and of earthwork. Prismoidal formulæ.

Applications of Solid Geometry to the setting out of moulds and bevels, and to problems that occur in connection with hand railing, rails to geometrical stairs, development of string; voussoirs and general masonry work; vaults; cupolas; arches, elliptical in elevation and slightly segmental in plan, &c.

SUBJECT 2.—PURE MATHEMATICS.

Lower Examination.

No candidate will be allowed to pass who fails to obtain marks in any one of the three sections.

N.B.—It is important that each candidate should bring to the examination a pair of compasses, a scale of equal parts, and a protractor.

Mathematical Tables will be provided at the examination.

1. Geometry.—The properties of lines, rectilinear figures, and circles, as far as they are treated in the first four books of Euclid. The theory of similar figures.

   The questions in this subject will generally be given so as to bring out as far as possible the candidate's knowledge of the principles of Geometry. Answers to questions may be given on any system which the student may have followed, provided the reasoning be clear and accurate.

2. Algebra.—The elementary rules of Algebra. Factors. The simplification of algebraical expressions. Simple equations, and problems

producing them. Involution and evolution. Surds. Quadratic equations, and problems producing them. Ratio, proportion, and variation. Arithmetical and geometrical progressions.

3. PLANE TRIGONOMETRY.—Definitions. Measurement of angles by degrees and radians. The trigonometrical functions, and the conversion of one into another. Use of the positive and negative signs to denote contrariety of direction. Tracing of the trigonometrical functions in magnitude and algebraic sign through the four quadrants. The arithmetical values of the trigonometrical functions of 30°, 45°, 60°, 75°, 90°, &c. The trigonometrical ratios of the sum and difference of angles, and of the multiples and submultiples of an angle.

LOGARITHMS.—Definition. Multiplication, Division, Involution, and Evolution by logarithms. The use of tables of logarithms of numbers, and of sines, cosines, &c., of angles. Interpolation by proportional parts for numbers and angles.

TRIANGLES.—Solution of all cases of right-angled and oblique triangles, and proofs of the requisite formulæ. Heights and distances. Area of a triangle.

Higher Examination.

Two papers will be set in this Examination, but the two papers will constitute one Examination only, and only one result will be declared for each candidate.

No candidate will be adjudged to have passed the Examination who does not show reasonable proficiency in the subjects of both papers.

N.B.—It is important that each candidate should bring to the examination a pair of compasses, a scale of equal parts, and a protractor.

Mathematical Tables will be provided at the examination.

FIRST PAPER.

1. ALGEBRA.—The theory of indices. Simple cases of the summation of series. The simpler tests of the convergence and divergence of series. The binomial, exponential, and logarithmic series. Partial fractions. Elementary Determinants. Imaginary and complex quantities. De Moivre's Theorem.

2. CO-ORDINATE GEOMETRY OF TWO DIMENSIONS.—Co-ordinates of a point.

Equations of straight lines, and the treatment of questions relative to their intersection, concurrence, inclination, parallelism, perpendicularity, &c.

Equations of circles, their tangents and normals. Questions concerning the intersection of circles, and the determination of circles which satisfy given conditions.

The simpler forms of the equations of the parabola, ellipse, and hyperbola, as determined from various definitions of those curves. The equations of their tangents and normals. The principal properties of their diameters, axes, foci, conjugate diameters, asymptotes.

3. CO-ORDINATE GEOMETRY OF THREE DIMENSIONS.—Co-ordinates of a point referred to rectangular co-ordinate axes. Direction-cosines of straight lines. Inclination of two straight lines. Locus of points whose co-ordinates satisfy a given equation, or two given equations. Equations of planes and of straight lines. Determination of their inclinations, and of the conditions of their parallelism and perpendicularity. Other questions concerning straight lines and planes. Equations and fundamental properties of surfaces of the second degree, especially with regard to surfaces of revolution.

SECOND PAPER.

1. DIFFERENTIAL CALCULUS.—Definitions. Limits. Differential co-efficients. Differentiation of simple functions, of inverse functions. Successive differentiation of functions of one variable. Taylor's and Maclaurin's Theorems and their simpler applications. Determination of values of functions when indeterminate in form. Differentiation of a function of a function and of implicit functions. Maxima and minima of functions of one independent variable. Differentiation of functions of two or more independent variables.

   Applications of the preceding to the geometry of plane curves referred to rectangular or to polar co-ordinates. Tangents, normals, sub-tangents, sub-normals, asymptotes. Singular points. Contact and curvature. Tracing of curves. Differential co-efficients of arcs and areas of plane curves, and of the surfaces and volumes of solids of revolution.

2. INTEGRAL CALCULUS.—Meaning of definite and indefinite integration. Integration of the more frequently occurring functions. Integration by parts. Rational fractions. Formulæ of reduction.

   Applications to areas and lengths of curves, to volumes and areas of surfaces of revolution, to centres of gravity, and moments of inertia.

3. ELEMENTARY DIFFERENTIAL EQUATIONS.—Integration of differential equations of the first order and degree. Integration of linear differential equations of the second and higher orders with constant co-efficients.

SUBJECT 3.—PRACTICAL MATHEMATICS.

Slide rules may be used at the examination. Mathematical Tables will be provided with the examination papers.

Compulsory questions may be set at the examinations.

Lower Examination.

Contracted and Approximate Methods in Arithmetical Computation.

Rules of Indices. Reasons for the use of logarithms.

The principle underlying the construction and method of using a common slide rule; the use of a slide rule in making calculations. Conversion of common logarithms into Napierian logarithms. The calculation of square roots by the ordinary arithmetical method. Simplification of fractions.

Being told in words how to deal arithmetically with a quantity, to be able to state the matter algebraically. Problems leading to easy equations in one or two unknowns. Easy transformations and simplifications of formulæ, and in easy cases finding any one of several quantities in a formula when the others are given. Practice in algebraic manipulation generally. The determination of the numerical values of constants in equations of known form, when particular values of the variables are given.

The factors of $x^2 + ax + b$ when numerical values are given for a and b.

Students ought from the beginning to be taught that even a complex looking formula is quite easy to evaluate if numerical values of the quantities are given, and that such symbols as sin a, log a, &c., merely direct him to refer to certain tables. To deduce complex formulæ may require much mathematical knowledge, but to use them needs mere arithmetic.

Simple rules in mensuration concerning circles and triangles; the areas of the surfaces of cylinders, cones and spheres, and their volumes. Practical methods of finding areas and volumes such as suggest themselves in experimental work. Determination of weights from volumes when densities are given.

Area of the surface of a circular anchor ring. The determination of the area of an irregular plane figure (1) by using a planimeter (a knowledge of the theory will not be expected), (2) by using Simpson's or other well-known rules for the case where a number of equidistant ordinates or widths are given, (3) by the use of squared paper whether the given ordinates or widths are equidistant or not, the "mid-ordinate rule" being used. Determination of the volume of a circular anchor ring. Centre of gravity. Guldinus' theorems.

The determination of the volume of an irregular solid by each of the methods for an irregular area, the process being first to obtain an irregular plane figure in which the varying ordinates or widths represent the varying cross sections of the solid. Prismoidal Formula.

Stating a mensuration rule as an algebraic formula. In such a formula any one of the quantities may be the unknown one, the others being known.

The practical uses of squared paper in plotting statistics, interpolation, probable errors of observation, finding average values, finding areas and volumes. The plotting of functions, such as $y = ax^n$, $y = ae^{bx}$, where a, b, n, may have all sorts of values. The straight line; meaning of its slope. Slope of a curve at any point in it. Easy exercises on rates of increase of y with regard to x in the case of $y = ax^n$. Determination of maximum and minimum values. The solutions of equations. Very clear notions of what we mean by the roots of equations may be obtained by the use of squared paper. Rates of increase. Speed of a body. Determination of laws which exist between observed quantities, especially of linear laws. Corrections of errors of observation when the plotted quantities follow approximately a straight line law. The probable formula connecting such quantities. Easy examples of the use of Integration.

If y is a quantity which depends upon another quantity x, and if the corresponding values are tabulated, there are many cases in which it is useful to tabulate $\delta y/\delta x$ for each interval; and also to tabulate $y.\delta x$ and so obtain what is an approximation to the integral of y.

Dividing lines by practical geometry into parts in given proportions, and other illustrations of the 6th Book of Euclid. Measurement of angles in degrees and radians. The definitions of the sine, cosine, and tangent of an angle; determination of their values by graphical methods; setting out of angles by means of a protractor or scale of chords when they are given in degrees or radians, also when the value of the sine, cosine, or tangent is given. Use of tables of sines, cosines, and tangents. The solution of a right-angled triangle by calculation, and by drawing to scale. The construction of a triangle from given data; determination of the area of a triangle.

Sines, &c., of angles greater than a right angle, the curve of sines.

The more important propositions of Euclid may be illustrated by actual drawing; if the proposition is about angles, these may be measured by means of a protractor; or if it refers to the equality of lines, areas, or ratios, lengths may be measured by a scale and the necessary calculations made arithmetically. This combination of drawing and arithmetical calculation may be freely used to illustrate the truth of a proposition. A good teacher will occasionally introduce demonstrative proof as well as mere measurement, but only if his pupils take pleasure in it.

The method of representing the position of a point in space by its distances from three co-ordinate planes. How the angles are measured between (1) a line and plane, (2) two planes. The angle between

two lines has a meaning whether they do or do not meet. What is meant by the projection of a line or plane figure on a plane. Plan and elevation of a line which is inclined at given angles to the co-ordinate planes. The meaning of the terms "trace of a line," "trace of a plane."

The distinction between a scalar quantity and a vector quantity. Addition and subtraction of vectors. Rate of change of a vector quantity.

Higher Examination.

The instruction given should include a revision of some of the more important portions stated in the syllabus for the Lower Examination. In addition, the following should be considered:—

More practice in the use of logarithm and other mathematical tables for finding numerical values from more difficult or more complicated formulæ. More attention to method in carrying out computations of all kinds. The use of approximate formulæ such as

$$(1 + a)^n = 1 + na \text{ when } n \text{ or } a \text{ is small compared with 1.}$$

Rules in Arithmetic (as of compound interest, &c.) and in Mensuration, stated as algebraic formulæ. Any one of the quantities in a formula may be the unknown one.

Practice in the simplification of algebraical expressions. Solution of equations, and problems leading to equations. Resolutions of a fraction into partial fractions.

Knowledge of such limits as $\sin\theta \div \theta$ when θ is small.

How to find the values of the sine, cosine, and tangent for angles greater than 90°.

Fundamental relations, such as $\sin^2\theta + \cos^2\theta = 1$.

Calculating the values of $\sin x$, $\cos x$, e^x, and $\log x$ using series.

Proving the fundamental formulæ for the sine and cosine of the sum or difference of two angles, such as

$$\sin (A + B) = \sin A \,.\, \cos B + \cos A \,.\, \sin B.$$

Formulæ derived from the above, such as those for the sum and difference of two sines or cosines, and those which connect an angle and the double angle.

The sine rule, or $\dfrac{\sin A}{\sin B} = \dfrac{a}{b}$ in triangles. Also, for a triangle, the rule $c^2 = a^2 + b^2 - 2ab \cos C$.

The expression for the area of a triangle, having given two sides and the included angle, $\frac{1}{2} ab \sin C$.

The truth of such formulæ ought to be illustrated numerically and graphically by taking numerical values of the quantities, but the proofs are also supposed to be known to candidates.

Theorems relating to areas and volumes of surfaces and solids of revolution. Exercises on the area of a segment and sector of a circle, the area of the surface of a sphere between any two parallel planes; approximate rules for length of a circular arc.

Finding centres of gravity and moments of inertia, using squared paper.

The plotting of functions on squared paper, including such as $y = ax^n$; $y = ae^{bx}$; $y = a \sin (cx + d)$; $y = ae^{bx} \sin (cx + d)$.

Having given observed values of two varying quantities which are supposed to follow one or other of laws like $pv^n = c$, $y = a + bx^2$, $xy = bx + cy$, to find the probable values of the constants.

When two varying quantities are known to follow a given complex law, to determine a simpler law which, between certain limits, will give values approximating to the correct ones.

Solving equations by the use of squared paper.

Maximum and minimum problems.

How the position of a point in space is defined by its rectangular co-ordinates x, y, z, or by its polar co-ordinates r, θ, ϕ; the relations between x, y, z and r, θ, ϕ.

Determination of the three angles α, β, γ which a given line makes with the three co-ordinate axes; the relation

$$\cos^2\alpha + \cos^2\beta + \cos^2\gamma = 1.$$

Determination of the angles between a given line and each of the co-ordinate planes.

When a plane is given by its traces, to determine its inclination to each of the three co-ordinate axes and planes.

Representation by its projections on the three co-ordinate planes, of a line whose position and real length are given.

Determination of the angle between two given lines; the angle between two planes whose traces are given. Represent by its projections the line of intersection of two planes whose traces are given.

Such examination of candidates as requires the use of instruments and drawing boards is regarded as part of Subject 1.—Practical Geometry and Graphics.

The scalar product and vector product of two given vectors, with illustrations. Easy Vector Algebra. The meaning of **C V A B** and **V C V A B**. Rate of increase of a vector quantity.

Rate of increase of one quantity relatively to that of another; approximate methods of calculating a rate of increase as, for example, in the case where simultaneous values of two varying quantities have been observed experimentally, or by finding the slope of the curve obtained by plotting such values. In what follows, the letters x and y may be replaced by others.

The term "differential co-efficient" as applied to a rate of increase; and the symbol for it, namely $\frac{dy}{dx}$, where y and x represent the two varying quantities.

Proofs of the rules for finding the differential co-efficient of y with respect to x, that is, $\frac{dy}{dx}$, when y and x are related in the following ways:—

$y = ax^n$; $y = ae^{bx}$; $y = a\cos(bx + c)$; $y = a\sin(bx + c)$; $y = \mathrm{A}\log(x + a)$.

The study of these functions and such studies of curves as require these differential co-efficients.

Proof and use of the rules for differentiating a product or quotient of two functions or the function of a function; partial differentiation.

Calculation of maximum and minimum values.

Integration regarded as the inverse of differentiation, or as a process of summation; the symbols

$\int y\,.\,dx$ and $\int_a^b y\,.\,dx$; rough methods of finding an approximation to $\int_a^b y\,.\,dx$ when tabulated numerical values of y and x are known.

The expressions for the integrals of

$$ax^n,\ ae^{bx},\ \mathrm{A}/(x + a),\ \mathrm{A}\sin(ax + b),\ \mathrm{A}\cos(ax + b).$$

Integrating by parts and by substitution and other simple devices. Finding areas of curves and surfaces and volumes requiring these integrals. The solution of easy differential equations. Illustrations of the use of the calculus in many kinds of study, more especially in physics and engineering. When x and y are tabulated, to find for a particular value of x the value of dy/dx.

Special attention ought to be paid to graphical methods of integration, using squared paper; the construction by graphical methods of curves from a given law of slope, this law being given either by means of a curve, or by a simple algebraic expression, or by means of a simple differential equation.

Natural and forced vibrations. In dealing with periodic functions of the time such as sin pt, the use of pi for d/dt where i is $\sqrt{-1}$. Illustrations from electric circuits with periodic currents. The study of sinh x, cosh x, tanh x. Simplification of complex functions of unreal quantities. The computation of sinh x or cosh x when $x = a + bi$. Illustrations from problems on heat conduction or telephonic circuits. In general it may be said that this syllabus comprises illustrations of the use of the calculus from all parts of mechanical and electrical engineering.

SUBJECT 4.—THEORETICAL MECHANICS (SOLIDS).
SUBJECT 5.—THEORETICAL MECHANICS (FLUIDS).

There are two distinct nomenclatures applicable to Theoretical Mechanics. According to one, the science that investigates the action of force is called mechanics, and is divided into (*a*) statics, treating of the equilibrium of particles and bodies, (*b*) dynamics, treating of the motion of particles and bodies, (*c*) hydrostatics, (*d*) hydrodynamics, treating respectively of the rest and motion of fluids, *i.e.*, liquids and gases. This nomenclature is adopted by many writers of authority, *e.g.*, by Poisson. According to the other, the term dynamics takes the place of mechanics, and the division is into: (i) statics, (ii) kinetics, (iii) hydrostatics, (iv) hydrokinetics. This is a question of words only, but of course one terminology may be better than another. It is, however, to be observed that a considerable number of questions, formerly treated under the head of (*b*) dynamics, relate to motion without reference to the forces producing it. These questions form a distinct branch of pure mathematics, to which the name of kinematics is now commonly given. Certain parts of kinematics come into this subject, but they occupy a subordinate position in it.

For the purpose of the Board's Examinations Theoretical Mechanics is treated as two subjects, the first corresponding to (*a*) and (*b*) defined above, the second corresponding, with modifications, to (*c*) and (*d*). In most cases it would be best for candidates to take up the Lower Examination in the first subject before attempting the second subject. However, they take their choice, and to enable them to take up the second subject separately the syllabus contains several articles which also come into the first subject.

In each subject there is a Lower and a Higher Examination. The relation between the standards is much the same in the two cases.

For the Lower Examination the candidate is required to make himself acquainted with the elementary propositions and formulæ of the science and with their formal proof in all cases where a knowledge of the differential and integral calculus is not involved. A knowledge of pure mathematics up to the point where the study of the calculus commences may be necessary. Great attention should be paid to graphical constructions and methods. A good drawing of an actual mechanical instrument or device takes the place of much written description and favourably impresses an examiner.

Experimental work will be found useful throughout in making students familiar with mechanical ideas.

In the Higher Examination it will be assumed that the candidate has a more advanced knowledge of pure mathematics, and in particular of advanced graphical methods.

Compasses, a scale of equal parts, and a protractor will be required at the examinations.

Compulsory questions may be set at the examinations.

SUBJECT 4.—THEORETICAL MECHANICS (SOLIDS).

Lower Examination.

1. Units of time and length; relative rest and motion; measurement of velocity and acceleration; composition of velocities and accelerations; angular velocity; unit of mass; density; specific gravity; unit of force; measurement of force; momentum; impulse; energy; work; rate of doing work.

2. Composition, resolution, and equilibrium of forces; moments; couples; centre of parallel forces; laws of motion.

3. Centre of gravity; reaction of smooth surfaces, points and hinges; friction; tension; the simple machines without and with friction; equilibrium of a body resting on a smooth or rough axle; the balance.

4. Uniformly accelerated rectilinear motion; motion on smooth and rough inclined planes; Atwood's machine.

5. Virtual work; stable and unstable equilibrium; work done by a variable force; diagrams of work; the indicator diagrams.

6. Motion of projectiles; motion in a circle; motion of a simple and of a compound pendulum; the small oscillations of a pendulum; convertibility of the centres of suspension and oscillation.

7. Equation of work and energy for a constant force and of impulse and momentum for an impulsive force; direct and oblique impact of smooth spheres.

8. Different states of matter; elasticity; resistances to elongation, compression and bending.

Higher Examination.

The student should be prepared to answer somewhat more difficult questions than those set in the Lower Examination.

1. General theory of the composition and resolution of forces and of the equilibrium of a rigid body.

2. Strength and resistance of materials; deflections and rupture of beams; the theory of the construction of roofs; determination of the stresses on the different parts of a trussed roof.

3. The elements of uniplanar kinematics; elementary theory of attractions.

4. Differential equations of the motion of a particle; constrained motion of a particle; motion of a particle under the action of a central force.

5. Equilibrium of threads; the common catenary; the catenary of equal strength.

6. Moments and products of inertia; motion of a rigid body about a fixed axis; energy of a rotating body; equations of the motion of a rigid body in two dimensions.

SUBJECT 5.—THEORETICAL MECHANICS (FLUIDS).

This subject cannot be understood unless the candidate has a preliminary acquaintance with the fundamental notions of force and motion, on which all parts of the science are based. These are given in Section 1 of the following syllabus.

Lower Examination.

1. Units of time and length; measurement of velocity and acceleration; composition of velocities and accelerations; angular velocity; unit of mass; density; specific gravity; units of force; measurement of force; composition, resolution, and equilibrium of forces; uniform circular motion; momentum, impulse, energy, work, rate of doing work; equation of work and energy; work done by a variable force.

2. Transmission of pressure through a fluid; surface of a liquid acted on by gravity and pressure at any point within the liquid; whole pressure; resultant pressure on an immersed surface, plane or curved; centre of pressure in simple cases.

3. Equilibrium of bodies floating freely or partly supported; metacentre in simple cases; tension of a thin flexible cylinder or sphere under internal fluid pressure.

4. The hydrostatic balance; the specific gravity bottle; Nicholson's hydrometer: hydrometer of variable immersions; suction pump; force pump; siphon; screw of Archimedes; air pump and mercurial gauge; compressed air manometer; the hydraulic press; the diving bell and diving dress.

5. Thermometers with Fahrenheit, Centigrade, and Réaumur scales; the absolute zero.

6. Pressure and elasticity of air; the gaseous laws; the barometer; height of the homogeneous atmosphere; effect on this height of variations of gravity and temperature; pressure of mixed gases; pressure of a vapour; saturation; dew point; densities of dry and moist air; work connected with a gas expanding at a constant temperature.

7. Discharge of a liquid from a small orifice in the side of a vessel; velocity of the descending surface of the liquids; surface of the liquid in a vessel which rotates steadily about a vertical axis; pressure at any point of the liquid.

Higher Examination.

The student should be prepared to answer somewhat more difficult questions than those set in the Lower Examination.

1. Pressure at any point of a fluid at rest acted upon by any forces; centre of pressure in the general case; stability of flotation in respect of small displacements.

2. Hygrometry; the air thermometer; determination of heights by the barometer.

3. Adiabatic expansion; Carnot's cycle; elementary theory of molecular forces and capillarity; the kinetic theory of gases.

4. Elementary hydrodynamics; equation of continuity; steady motion under the action of gravity; the theorem of Bernouilli; simple cases of wave motion under gravity; oscillatory waves; long waves in shallow water; waves in very deep water.

GROUP B.—ENGINEERING.

SUBJECT 6.—MACHINE CONSTRUCTION AND DRAWING.

Students presenting themselves for examination in this subject are expected to show that they possess a general knowledge of machinery, combined with an accurate knowledge of the form of the commoner elements which enter into the construction of machines; and a knowledge of the properties of the materials employed in machine construction. They must understand how to estimate the straining actions brought on to the materials of the several parts, and how to proportion the parts in order properly to resist these actions. They must be familiar with the various workshop processes by which the individual parts of a machine are made and wrought to the finished size, and the ways in which the parts are assembled and placed in their proper positions relatively to one another.

In addition to this knowledge the student must have acquired the art of making a drawing of such a nature that a workman can make what the drawing represents without the necessity of asking a single question from the designer, or of exercising his own discretion with respect to the size or form of the smallest detail.

The students' knowledge of this subject will be tested chiefly by means of drawings, though questions *relating to Constructional details* requiring hand sketches and written answers *will be set in the Lower Examination.*

A student should be taught to make a working drawing of any machine part he sees. This will lead ultimately to his acquiring the power of making a working drawing of anything he conceives. From the first, attention should be given to the proper dimensioning of drawings. The figures should be bold and clear, and the dimensions given should be such that during the whole process of manufacture in the shops the workman has never to find the dimension he wants by addition or subtraction of the dimensions given or by measurement from the drawing.

The following suggestions for a course of instruction may be found useful. After a few preliminary exercises to gain some skill in the use of instruments the student may be set to make a few tracings of simple drawings, and these tracings should be made, some on tracing paper and some on tracing cloth. If possible, students should then be shown how to reproduce these by one or more of the many photographic processes employed by engineers for the purpose. Then the drawing of simple machine details should begin. Copies should not be used, but the student should make a freehand and dimensioned sketch from the object itself. The teacher should devote special attention to the examination of these freehand sketches, and should encourage the student to make all his sketches in a squared-paper note-book with as much neatness and accuracy as possible. After sketching and drawing the various machine details the student should make a general drawing of a complete machine from actual measurement, care being taken to dimension the centre lines properly. With practice and care a student should soon be able to make completely dimensioned freehand sketches of a machine, so that the drawing can be made from the sketches without further reference to the machine itself. To cultivate this carefulness, the student should enter in his note-book the number of times he has to return to the object to take an omitted dimension. As an introductory exercise to design, a small-scale general arrangement drawing of an engine or other machine should be given to a student, from which he should make detail drawings of the fastenings, and the simpler parts which would probably be merely indicated on the general arrangement.

In no part of the course should drawings be given to the student merely to copy. In the earlier stages he should draw from the objects themselves; in the later stages drawings may be given him from which to make enlarged drawings of details, or from which he can make a general drawing from given details.

A practice which is common in many drawing offices is to make drawings in pencil only, to trace them in ink, and to make photographic copies of the tracings. The tracing is kept in the office for reference, and the copies are sent into the works. A tracing exercise will be set in the Lower Examination to be done in Indian ink. Tracing paper will be supplied, but a candidate must bring his own Indian ink.

All students should provide themselves with the following scales:—

Full size, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{3}{4}$, $\frac{3}{16}$, $\frac{1}{3}$, $\frac{1}{12}$, reading inches and fractions of half, quarter, or eighth inches, and these scales must be brought to the examination.

A copy of the examination tables will be supplied to candidates in the Higher Examination to assist them in calculation. Slide rules may be used.

Compulsory questions may be set at the examinations.

Lower Examination.

The candidate's knowledge and skill will be tested by an exercise in drawing, an exercise in tracing, and by some questions.

In the drawing exercise, which must be drawn in simple or orthographic projection, in pencil, to a given scale, a candidate may be required to draw details from a given general arrangement, or to draw a general arrangement from given details, or to draw sectional views, elevations, and plans from sketches not necessarily in proportion, but such as would be found in a draughtsman's note-book.

Fastenings and parts omitted must be added. A candidate will be expected to exhibit skill as a draughtsman by the accuracy and neatness of his drawings.

All the views drawn by the candidate must be projected the one from the other, and no credit will be given if the candidate shows that he does not appreciate the fact that he is producing a representation of a solid piece of machinery, and that he is not merely copying a drawing.

Centre lines must be shown distinctly. Lines not needed in the finished drawing must be rubbed out.

The exercise in tracing will be of a simple character and designed to test the skill of the candidate in neat lining, and in the neat and accurate joining of curves and lines with curves. It is to be done in ink, and the lines should be fairly heavy but of uniform thickness, with no visible discontinuities where lines and arcs of circles join or touch.

Questions will be set requiring neat freehand sketching of machine and engine details, or requiring brief descriptions of engines or engine parts, machine details, or workshop processes involved in the construction of engines and machinery. Exercises involving the determination of the sizes of parts subjected to simple tension or compression or pure shearing may be set at this stage, and part of the drawing exercise may require such calculations to be made, in order to determine the size of omitted parts or parts not dimensioned.

The scope of the examination is indicated in the following list of subjects, which a student in machine construction should study. He should make freehand sketches in his own note-book of good examples of as many of the details enumerated as possible, and accurate working drawings of a few of the machines in general arrangement, together with the corresponding detail drawings.

Fastenings.—Nuts and bolts. Set screws. Tap bolts. Studs. Forms of screw threads. Whitworth nuts and bolts. Keys. Cotters. Pins. Devices for locking nuts. Forms and proportion of rivets used in boiler construction, simple calculations relating to the design of single and double riveted lap and butt joints.

Bearings.—Form and proportions of bearings. Details of construction to facilitate adjustment, to provide for wear, and to facilitate alignment. Swivel, thrust, footstep, crank shaft, connecting rod, propeller shaft, and line shaft bearings. Locomotive axle boxes. Ball bearings. Roller bearings.

Different forms of bearing supports. Pedestals, hangers, brackets, and wall boxes.

Different forms of bearing lubricators, including continuous lubrication by means of a ring as applied to the bearings of electrical machinery.

WHEELS AND PULLEYS.—Constructional details of spur and bevel gearing. Ordinary proportions of wheels and wheel teeth, together with the forms of profiles used for wheel teeth.

Belt and rope pulleys. Open and crossed belts. Guide pulleys. Belt and rope joints. Belt shifting gear. Countershafting. Chain gearing. Worm gearing. Simple forms of cams and ratchets.

SHAFTS AND SHAFTING.—Different forms of shaft couplings. Disengaging and friction clutches.

ENGINE AND ENGINE DETAILS—Cylinders. Pistons. Methods of connecting together piston and piston rods. Stuffing boxes. Packing, including metallic packing. Crossheads and slides. Connecting rods. Cranks and Crank Shafts. Various forms of slide valves. Cut-off or expansion valves. Piston valves. Drop valves. Equilibrium valves. Balanced valves. Valve buckles. Valve rods and guides. Eccentric rods. Eccentric straps and sheaves. Governors. Stop valves. Details of internal combustion engines. Cams and cam gear. Water jackets. Valves and spindles.

BOILER AND BOILER DETAILS.—Construction of boilers of the marine, locomotive, and land types. Shells. Stays, including gusset, roof or girder, longitudinal, and screwed stays. The boiler mountings customarily fitted to any of these types of boilers.

PIPES AND PIPE JOINTS.—Joints for steam, gas, and water pipes. Union joints for small-diameter pipes. Methods of making joints.

HYDRAULIC MACHINERY. — Details of construction of pumps, accumulators, joints, and the hydraulic machinery commonly used in a workshop. Cup, **U**, and neck leathers.

TYPICAL MACHINE TOOLS, WITH DETAILS OF CONSTRUCTION.—Lathes, drilling machines, shaping machines, slotting machines, planing machines, milling and grinding machines, horizontal and vertical boring mills.

Different forms of tools and cutters, together with a knowledge of cutting angles and cutting speeds.

ELECTRICAL MACHINERY.—Mechanical details of bearings, lubrication, fastenings, and the general construction of the framing and armature.

MATERIALS.—General properties of the materials used in machine construction, including cast iron, wrought iron, steel, copper, brass, gunmetal, bronze, and white metal.

In this Examination the questions and exercises will be of a simple character, and will not relate to the details of special machinery. A choice will be given in the drawing exercise, and a student will not be expected to answer, in addition, more than two out of about five questions requiring written descriptions or freehand sketches.

Higher Examination.

The candidate's knowledge and skill will be tested by an exercise in drawing *which will involve knowledge of the principles of design.*

No tracing will be required.

A more extended knowledge of the subjects enumerated in the syllabus for the Lower Examination will be required, together with a knowledge of the methods used to determine the sizes of parts by calculation.

In the drawing exercise, which must be drawn in simple or orthographic projection in pencil to a given scale, the candidate will be expected to show some facility in the design of the simpler parts of machine and engine and boiler details. He will be expected to work from a simple specification usually, but not necessarily, accompanied by sketches or drawings, and to add omitted details correctly proportioned and suitably formed. The drawings must be neatly and accurately drawn.

The following subjects should be studied in connection with machine design :—

The design of pieces subject to pure tension, pure compression, pure shear, and pure bending. The simple cases of combined bending and torsion

The safe working stresses corresponding to steadily applied loads; varying loads; and loads applied so that the corresponding stresses vary between a maximum positive and a maximum negative value. Factors of safety.

The general design of riveted joints; of flange couplings; of cottered joints; of pin and knuckle joints; of ties and struts; of shafts and axles. The design of bearings, together with the working pressures which may be used for journals running in one direction as main shaft bearings or intermittently as in cross-head journals. Forced lubrication and water-cooled bearings.

Problems connected with the design of valves and valve gears to produce a given distribution of steam. The simple eccentric gear. Reversing motions. The link motion. The design of valve gear of the Meyer type with separate cut-off valve. Valve diagrams.

Simpler problems in connection with the inertia stress in machine parts, particularly in connection with connecting and coupling rods. The design of balance weights for engines and machinery. The problems will be of a simple kind and will not include secondary balancing.

The properties of the materials used in machine design, together with a knowledge of the stress-strain diagram corresponding to them. Limit of elasticity. Ultimate strength. Percentage elongation and reduction of area. Yield point. Tempering. Hardening. Softening. Annealing. Case-hardening. The composition of the common alloys, such as brass, gunmetal, and white metal.

A choice will be given in the drawing exercise. The candidate will be expected to draw well, and to exhibit an accurate knowledge of the fundamental principles of machine design, and to possess an accurate knowledge of the forms of the fundamental machine details like fastenings, bearings, and slides.

SUBJECT 7.—APPLIED MECHANICS (MATERIALS AND STRUCTURES).

SUBJECT 8.—APPLIED MECHANICS (MACHINES AND HYDRAULICS).

Applied Mechanics is treated as two subjects. The first is arranged to include those matters usually connoted by the terms Strength of Materials and Theory of Structures, and is intended to meet the special

requirements of students intending to become Civil Engineers, Architects, or Structural Engineers.

The second is arranged to include those branches of Applied Mechanics usually connoted by the terms Theory of Machines and Hydraulics, matters which, in addition to those in the first subject, must be studied by students of Mechanical Engineering.

There must of necessity be a little overlapping through the inclusion of certain common matters in both subjects.

All these subjects should be taught as far as possible in connection with Laboratory Work. The equipment for a Laboratory of Mechanics need not be expensive. A great deal is to be learnt by the use of apparatus of the simplest kind.

The physical properties of materials may be thoroughly studied by means of a small testing machine of about ten tons capacity, which may be arranged to apply a tensile, a compressive, or a torsional load to small test pieces. Machines of a much smaller type, arranged to apply a load of about one ton, and without a straining cylinder, may be used in connection with an extensometer for the study of the elastic properties of materials.

Much simple apparatus can be made for the purpose of illustrating the principles of graphical and analytical statics.

Pulley blocks, small winches, and the machine tools in the workshops may be used to illustrate the principles of mechanism, and there is apparatus available for illustrating the dynamics of engine balancing.

A hydraulic jack, a small pump, a few tanks, with weirs, orifices, and notches of various shapes, a pipe with manometers to show the pressure at different points, are all kinds of apparatus inexpensive to provide but invaluable in the teaching of Hydraulics.

In each subject there will be a Lower and a Higher Examination. The examinations in Materials and Structures will be held on one evening, the examinations in Machines and Hydraulics on another evening.

The necessary Tables will be supplied, and candidates will be restricted to the use of these Tables, and will not be allowed to bring with them to the examination room any other Mathematical or Logarithm Tables. Slide rules may be used.

Compulsory questions may be set at the examinations.

SUBJECT 7.—APPLIED MECHANICS (MATERIALS AND STRUCTURES).

Lower Examination.

GRAPHICAL AND ANALYTICAL STATICS.—Determination of the resultant of a system of forces in one plane; forces in hinged structures; moments of forces; couples, centres of gravity; moments of inertia of areas.

MANUFACTURE AND PROPERTIES OF MATERIALS.—Timber, stone, bricks, lime, cement; concrete and reinforced concrete; cast iron, wrought iron, and steel; copper and its alloys.

ELASTIC THEORY.—Stress and strain; tension, compression and shearing stresses; extension, compression, and sliding strains; modulus of elasticity and resilience; ties and struts, the effect of the form of the cross section, of the length, and the manner of fixing its ends upon the strength of a strut or pillar; thin vessels subjected to internal fluid pressure; cottered and riveted joints; bending moments and shearing forces, moments of resistance of beam sections, calculation of tensile and compressive stresses at all places in a beam section; simple torsion, and strength and stiffness of shafts; lines of resistance in arches.

TESTING OF MATERIALS.—Testing of materials by tension and bending; stress-strain curves; yield point, tenacity, extension, reduction of area, work of fracture; effect of shape of tensile test bar; effect of sudden loading; initial stresses.

Higher Examination.

GRAPHICAL AND ANALYTICAL STATICS.—Determination of the resultant of forces not in one plane; forces in parts of a structure not in one plane; force diagrams to determine the forces in the various members of different types of roof trusses and built-up girders due to dead and live loads; curve of inertia; ellipse of inertia and core.

ELASTIC THEORY.—BEAMS AND GIRDERS.—Bending moments, shear forces, and deflection of beams in general; beams and girders fixed at the ends; continuous girders; relation between curvature, slope, and deflection; deflection and slope from bending moment diagrams; shearing stresses in beams; deflection due to shear; resilience of beams; combined bending and thrust. STRUTS.—The design of struts, Euler, Rankine, Gordon, and other formulæ; non-axial loading of struts; struts laterally loaded.

TORSION.—Stability of shafts under centrifugal force, combined bending, twisting, and thrust; twisting vibrations in shafts.

STRUCTURAL DESIGN.—Bridge girders and roof trusses; riveted joints of all classes; masonry dams; retaining walls, not surcharged, and surcharged; depths of foundations to support a given loading; masonry and metal arches; theory of masonry and brickwork arches, and of metal arches with two or three hinges, graphical methods to be employed as much as possible; reinforced concrete; moments of resistance of beams of rectangular and T section; reinforced concrete columns, approximate theories only will be required.

TESTING AND PROPERTIES OF MATERIALS.—Commercial testing of metals, timber, stone, cement, &c. Strain hardening and annealing of metals. Impact tests. Repetition of loading. Hardness tests. Results of the most recent investigations into the properties of the more important alloys of iron and of copper.

SUBJECT 8.—APPLIED MECHANICS (MACHINES AND HYDRAULICS).

Lower Examination.

GRAPHICAL AND ANALYTICAL STATICS.—Determination of the resultant of a system of forces in one plane; forces in hinged mechanisms; moments of forces; couples; centres of gravity; moments of inertia of rotating bodies.

DYNAMICAL THEORY.—Velocity and acceleration; force and motion of bodies having a motion of translation; average force of a blow; energy, work, and power; sliding and rolling friction; mechanical advantage, velocity ratio, and mechanical efficiency; dynamics of rotating bodies; centrifugal force; reciprocating motions and vibration linear and angular; balancing of quick-running machinery; vibration.

MECHANISMS AND MACHINES.—Conversion of motion; velocity ratios; belts, ropes, chains, links, wheel trains; chain gearing; lifting tackle; screws; cylindrical bearings; ball and roller bearings; couplings and clutches.

HYDRAULIC THEORY.—Fluid pressure; changes of pressure and velocity along the stream lines in fluids; in the various parts of a centrifugal pump or turbine. Gauge notches for measuring water. Friction in

pipes, and the effect of friction in pipes and passages of hydraulic machinery. Impact of jets on fixed and moving vanes.

HYDRAULIC MACHINERY AND APPLIANCES.—Force pump. Hydraulic press. Hydraulic jack. Hydraulic cranes and lifts. Thomson's jet pump. Venturi and other meters.

Higher Examination.

MECHANISM AND MACHINES.—Lower and higher pairing; sliding and rolling contact. Link mechanisms in general. Velocity and acceleration diagrams and images. Rolling cylinders and cones and the most general motion of bodies; mechanical integration. Forms of teeth for spur, worm, and helical gearing. Slipping of belts. Centrifugal forces in belts and pulley rims. Theory of flywheels. Friction of journals, pivots, screws, wheel teeth, &c. Dynamical loads on machines, vibration and the effect of friction on vibration. Balancing of machinery.

HYDRAULICS.—Friction and flow in pipes and channels. The changes in pressure and velocity along and across stream lines in water or air. Loss of head along a channel due to change of section and change of direction. Forces set up by the sudden stoppage of flow in a pipe. Rotation in a fluid. Balancing of lifts. Hydraulic ram. Centrifugal pumps. Water turbines. Fans. Hydraulic transmission of power. Ship resistance.

SUBJECT 9.—HEAT ENGINES.

The necessary Tables will be supplied, and candidates will be restricted to the use of these Tables, and will not be allowed to bring with them into the examination room any other Mathematical or Logarithm Tables. Slide rules may be used.

Each candidate at both the Lower and the Higher Examinations will be furnished with a copy of the temperature-entropy diagram, and the candidate will be expected during the examination to make practical use of it in solving some of the problems on water-steam which will be set in the examination paper.

Compulsory questions may be set at the examinations.

Lower Examination.

A candidate will be expected to know generally the fundamental principles governing the transformation of heat energy into mechanical energy by means of heat engines. He must be familiar with the constructive details of heat engines, and be able to produce neat free-hand sketches of the general arrangement and the details of heat plants. For this purpose he should study closely some one form of boiler with the details of the staying, and should sketch all the boiler mountings fitted to secure its safe working. In the same way he should study the constructional details of some one form of steam engine with its pipes, stop valves, relief valve and condensing plant. He should also give attention to the constructional details of gas engines, petrol motors, and oil engines.

He should have some knowledge of the history of the development of heat engines, devoting special attention to Watt's classical researches and improvements, and to the contribution to the theory made by Carnot and Joule. In dealing with the properties of steam he should become familiar with the use of Steam Tables.

Lecture and exercise work should be carried out in conjunction with laboratory work. The equipment for a suitable heat laboratory need not be expensive. A small steam plant consisting of a boiler and an engine fitted with a surface condenser; a small gas engine, a small oil engine, a petrol motor engine; these together with the necessary measuring instruments, indicators, planimeters, measuring tanks, &c., would provide ample apparatus for the purpose. Visits should be made to works in the district, and indicator diagrams should be taken from engines working under industrial conditions.

The following enumeration of subjects gives a general idea of the course of study which should be followed. The order in which the different parts of the work should be taken is to some extent immaterial.

Energy in its various forms.

Equivalence of the different forms of energy. Joule's equivalent.

The first law of thermodynamics.

General description of a steam plant, including a surface condenser, a feed-water heater, and a superheater.

Calorific value of fuels.

Air supply required per pound of coal. Products of combustion. Methods used to maintain the air supply. Natural draft produced by chimneys. Forced draft produced by fans. Closed ashpits. Closed stokeholds. The locomotive blast pipe. Measurement of draft by the U tube. Pounds of coal which can be burnt per square foot of grate per hour in various types of boiler furnaces.

Transmission of heat from the furnace gases to the water in the boiler. Heating surface. Conditions determining the transfer of heat across the heating surface between the gas and the water in the boiler; radiation from the flame; conduction; convection; influence of the surfaces in contact with the hot gas and the water.

Rate of transmission per square foot of heating surface different at different parts of the heating surface. Transmission of heat from the relatively cool furnace gas to the feed water across the heating surface of a feed-water heater. Economisers.

Transmission of heat from the hottest furnace gas to the steam across the heating surface of a superheater. Different forms of superheaters. Superheaters as applied to marine boilers, locomotive boilers, and land boilers. Separately fired superheaters.

The properties of steam. The steam tables. Heat energy contained in a given weight of dry saturated steam; of wet steam, of steam superheated to a given temperature. Evaporation.

Pounds of fuel required in practice to evaporate one pound of dry saturated steam. As the steam is produced and led by the steam pipe to the engine cylinder its place is taken by an equal weight of water introduced into the boiler through the clack valve by the action of a feed pump or injector. Different forms of feed pumps. Different forms of injectors. Safety valves, and other boiler mountings.

The steam engine cylinder; the place where a part of the heat energy carried by the steam is transformed into mechanical work.

The indicator diagram. The indicator and the indicator rig.

The points of cut-off, release, compression, and admission, expressed as percentages of the stroke.

The average effective pressure. Calculation of the horse-power. Addition to a diagram of the axes of zero pressure from the barometer reading at the time the diagram was taken, and the axis of zero volume which requires that the clearance volume be known. Determination of clearance volume.

The pressure and volume of the steam in the cylinder can be read off at any point on the diagram when these axes are added. The corresponding weight of steam present can be found only if the state of the

steam is known also. If it is dry and saturated, as is probable on the compression curve, the weight can be found from the steam tables.

The hypothetical indicator diagram corresponding to a given cut-off, release, compression and admission. The different forms of expansion curve.

Work done per cubic foot of steam. How it depends upon the back pressure. Best cut-off.

Difference between the weight of steam fed to the cylinder and the weight accounted for by the indicator diagram. Condensation. Leak. Steam jackets. Drainage of cylinders. Reduction of the difference by superheating; by carrying out the expansion in stages in two or more cylinders. The compound engine. Arrangement of cylinders in two-stage two-cylinder engines; in three-stage three-cylinder engines; in two-stage three-cylinder engines; in three-stage four-cylinder engines; in four-stage four-cylinder engines.

The surface condenser. Transmission of heat from the exhaust steam across the heating surface of a surface condenser to the water circulating through the condenser. The circulating pump. The air pump. The hot well. Different forms of condensers. The jet condenser; cooling ponds. Cooling towers. Water supply required in given conditions or of steam condensed by given water supply.

Testing steam engines. Brake horse-power. Different forms of brakes. Mechanical efficiency. Thermal efficiency of engine, of a boiler; of the steam plant. Methods of stating performance.

The slide valve. Steam and exhaust laps. Negative lap. Inside and outside steam admission. Trick valve. Double-ported valve. Balancing position. Balanced slide valves. Piston valve. Corliss valve.

The crank and connecting rod. Piston displacement curves.

The simple eccentric valve gear. Eccentric sheave. Eccentric strap. Eccentric rod. Angular advance. Angular lag. Displacement diagram for the valve centre. Diagram showing simultaneous displacements of valve and piston on a crank angle base. The valve diagram. The Zeuner diagram; the Reuleaux diagram. The Bilgram diagram. Problems on the slide valve and steam distribution in the cylinder.

Valve gears with independent cut-off valves, and problems connected therewith. The Meyer gear. The Corliss gear. Trip gears like the Sulzer gear.

Reversing motions. A general knowledge of the link motion: the Joy gear and the Walschaert gear.

Governors. The Watt governor. The loaded governor. The spring loaded governor. Shaft governors. The combination of governor and trip gear.

Flywheels.

The crank effort diagram. The inertia forces in reciprocating motion. The pressure exerted at the crosshead pin to drive the engine after correction for back pressure and inertia force. The torque or turning couple on the crank shaft. The effect of the flywheel in regulating the speed. Fluctuation of speed in relation to the energy in the flywheel. Reversal of thrust.

Balancing of engines. Balancing of revolving masses. Balancing of reciprocating masses. Questions in the Lower Examination will be limited to simple cases where the reciprocating masses are assumed to move with simple harmonic motion.

Balancing of a locomotive. Balancing of a marine engine.

Balancing can in general only be properly carried out if there are at least four lines of parts.

Steam turbines. The flow of steam. Nozzles, the expanding nozzle. The Laval turbine. The Laval flexible shaft. The Parsons turbine. The Curtis turbine.

Fundamental rules about turbines. Work done per pound of steam flowing to the wheel.

Internal combustion engines. Gas engines. Fundamental laws of gases. Properties and calorific values of town gas and producer gas. Air required for complete combustion; excess air. Oil engines. Calorific value of oil fuel. Different forms of oil engine.

The Otto cycle. The indicator diagram. Average effective pressure and corresponding horse-power. Brake horse-power. Mechanical efficiency. The petrol engine. Carburetters. Water circulation. Sparking plugs. Methods of producing the spark. Advancing the spark. Control.

During the teaching of this subject the students should as soon as possible be familiarised with the notions of the second law of thermodynamics, and the way it operates to limit the amount of heat energy which can be converted into mechanical energy. The law should be explained in connection with the efficiency of a perfect heat engine, and as early in the course as possible the temperature-entropy diagram should be introduced and put into use in connection with various problems.*

Higher Examination.

A more extended knowledge of the subjects enumerated in the syllabus for the Lower Examination will be required, and questions may be set in any of the subjects included in that syllabus.

In addition a candidate should follow a course of study outlined in the following syllabus:—

The first and second laws of thermodynamics. Joule's experiments. The efficiency of the Carnot engine. Carnot's cycle reversed. Reversible engine. Carnot's principle. Efficiency of perfect heat engine. Condition of maximum efficiency. Regenerators. Stirling's engine.

Formation of steam under constant pressure and otherwise than under constant pressure. Isothermal and adiabatic curves for steam. Carnot's cycle with steam for a working substance. Rankine cycle. Efficiency of a perfect steam engine working on the Rankine cycle for the case of wet-dry saturated and superheated steam. Absolute temperature. Calculation of the density of saturated steam.

Entropy. Entropy of steam. Temperature-entropy diagram, and its applications.

Refrigerating machinery. Vapour compression machines.

Coefficient of performance. Bell-Coleman machine.

Transmission of power by compressed air.

Testing steam engines. Ratio between the actual efficiency and the efficiency of the corresponding Rankine engine of comparison.

The distribution of steam effected by a link motion for a given setting of the reversing wheel or lever. Valve diagram for a link motion. Problems connected with the design of a link motion. Problems connected with the design of radial valve gears. Valve diagrams for radial valve gears.

Balancing of engines and the vibration caused by unbalanced engines. Secondary balancing. The Yarrow-Schlick-Tweedy engine.

Inertia stresses in the parts of an engine. Inertia stresses in the connecting rod and in the coupling rod. Design of a coupling rod considered as a laterally loaded strut. Inertia stresses in crank shafts. Torsional oscillations of crank shafts. Centrifugal whirling of shafts.

Errors in indicator diagrams due to the inertia of the parts, pencil friction and the stretching of the cord.

Actual behaviour of steam in the cylinder. Wall action. Condensation and re-evaporation. Curve on the indicator diagram representing

* The Board of Education publish a Temperature-Entropy Diagram Sheet for Water-steam which affords a means of solving problems on steam quickly and accurately. The Sheet ought to be used under dulled glass so that pencil lines drawn for each problem may be sponged out. Copies of the Sheet may be purchased, either directly or through any Bookseller, from Messrs. Wyman and Sons, Limited, Fetter Lane, London, E.C., and 54, St. Mary Street, Cardiff; or H.M. Stationery Office (Scottish Branch), 23, Forth Street, Edinburgh; or E. Ponsonby, Limited, 116, Grafton Street, Dublin.—Price one penny.

water present during expansion. Influence of speed, size and ratio of expansion. Advantages of compound expansion, and superheating.

Calculations of air supply required for a fuel the analysis of which is given. Calculation of the air actually supplied to a furnace from an analysis of the flue gas. Methods of determining the calorific value of a fuel. Methods of analysing flue gases. The corrosion of boilers. Water softening and water softening plant.

Steam turbines. Details of construction. Determination of blade angles from given data. Strength of rapidly rotating wheels, discs and drums.

Thermodynamic efficiency of internal combustion engines.

Standard cycles. The air standard cycle. Calculations relating to heat transference between the working substance and the jacket water of internal combustion engines. Effect of the compression ratio on the efficiency. Testing internal combustion engines. Measurement of gas and air supply. Analysis of exhaust gases. Weight of charge in a gas engine.

A student should by the working of many examples get a thorough knowledge of the way to calculate the heat absorbed or rejected by a working substance during a change of state. Many examples may with advantage be worked in connection with this by application of the first law of thermodynamics to the case of a gas whose characteristic equation is known.

With regard to the construction of heat engines a student will be expected to have sufficient knowledge of the strength of materials and applied mechanics to work out the sizes of the principal members of an engine. He should also be able to fix the chief dimensions of a steam plant of given power. In particular the sizes of engine cylinders to produce a given horse-power when speed, pressure, and steam distribution are given.

SUBJECT 10.—BUILDING CONSTRUCTION.

The instruction given should be so arranged that by the time the student finishes his course of study, he should have acquired a knowledge of building materials, plant and construction sufficient for the work upon which he is likely to be engaged.

In order that he may be able to make free use of this knowledge in practice, he must also be a good draughtsman; good drawing is an essential part of the course, but it must always be borne in mind that drawing is a means and not an end in itself; drawings of work to be carried out should be such as to give full information and exact guidance to workmen who may have to use them. Candidates for the Higher Examination should have acquired proficiency in making finished drawings as well as what may be called descriptive and explanatory sketches.

All students should practise freehand drawing of details from their own measurements of actual parts so that they may be able readily to make a neat dimensioned sketch from which a drawing to scale might afterwards be prepared, or which may itself be sufficient for purposes of explanation. The use of squared paper may be introduced with advantage in exercises of this kind.

A larger number of questions will be set in the examination papers than the candidate will be allowed to attempt, so that he may have some range of selection of questions which bear upon branches to which he has given special attention.

It should be seen that candidates are fairly provided with pens, ink, pencils, and drawing instruments (including T and set squares, drawing boards, &c.) when they present themselves for the examination. The use

in examination of the ordinary boxwood, ivory, or paper scales and protractors, and slide rules, is permitted.

Mathematical Tables will be provided with the Higher Examination papers.

Compulsory questions may be set at the examinations.

Lower Examination.

The Course of Instruction should cover a good general knowledge of all the subjects connected with ordinary building construction, together with simple exercises in calculating quantities of materials. These calculations are not such as a Quantity Surveyor would make, but such as would have to be made by a Foreman of Works who has to order sufficient materials for the amount of work which he knows has to be done.

The class lessons and drawing practice should include the following subjects:—Excavation in various kinds of soils, including strutting and planking, concrete foundations for walls and piers, the use of damp courses and the materials employed for them; gauged brickwork; hollow walls and the various methods of bonding them together; junctions of walls of various thicknesses and at different angles; chimney breasts and flues; the various bonds of brickwork, including irregular bonds; fire-proof construction in floors and roofs; the best known building stones, their quarrying, bedding, cutting and dressing, and the various kinds of masonry in walls, window dressing, copings, &c.; characteristics of timber, its conversion and seasoning. Attention should be given to the increasing use of machinery in treating timber for carpenters' and joiners' work; advanced carpentry and joinery; ordinary forms of staircase construction with close strings and bent strings; two and three-light windows with cased frames and hung sashes, and also with solid frames, mullions and transoms, and casements; outside doors with bolection mouldings, sashes, doors and the finishings of door and window openings; all kinds of timber roof trusses and the various finishings in eaves, hips, ridges, &c.; the nature, qualities and weights of various kinds of roofing materials; elementary drainage; the laying and jointing of glazed stoneware pipes; all kinds of plumbers' work, including cold water supply to cisterns, and the position of the same in a house; bath, sinks, water-closets and their connections, waste pipes, soil pipes, ventilation pipes, &c.; all kinds of plastering, including the composition of the various coats; scaffolding for large buildings, shoring, strutting, needling, and under-pinning; centring for arches up to 15 feet span; the general principles of loaded beams; the use of the triangle and polygon of forces in order to determine practically the resultant force in direction and magnitude, and to resolve such a resultant into its component forces; the determination of the stresses in simple braced structures; elementary exercises in the calculation of strength of materials.

In all these subjects practical examples of the materials used and the various operations of dealing with them should be brought before the student, either in the class room or elsewhere; in as many cases as possible, he ought actually to see and handle full-size examples of everything in which he is being instructed theoretically. He should also familiarise himself with the nature and use of all the tools used in building operations. Teachers should make a point of accompanying their students for practical inspection of any building operations going on in their locality. Every student ought to examine in detail the structure of the buildings in which he lives, works, or attends classes.

Higher Examination.

A more extended knowledge of the subjects enumerated in the syllabus for the Lower Examination will be required together with a knowledge of the following subjects:—

Foundations—natural and artificial, upon land and under water; damp sites and their treatment.

Terra-cotta and artificial stone; their manufacture and uses.

Principles of sanitation; drains, traps, gulleys, disconnecting chambers, sewers, their ventilation and drain connections, iron drains. Drain testing and ventilation.

Masonry. Character of various stones used in building and localities where found, how to test for quality and bed, fitness of various stones for different atmospheres, weight generally, approximate strength and chemical composition; stone stairs, composite walls, arches.

More detailed knowledge of scaffolding, including gantries, elaborate centring, framing for concrete walls and modern methods of hoisting materials, roofing up to 60 feet span. Timber: its seasoning, diseases, causes of decay, and means of preserving it. Roof timbering, open, hammer beam and composite trusses. Modern iron trusses including trussed purlins; all roof finishings, including slating, tiling, plumbing, &c., skylights and lanterns. Wood stairs of all kinds, including hand-railing.

Ventilation and heating; hot water supply; provisions for gas and electric supply, in so far as these may affect the structure of the building; water supply; lightning conductors; various kinds of glass and glazing; plastering in all its branches.

General properties of cast iron, wrought iron, and steel.

Safe working stresses for working loads.

Factors of safety.

Design of ties, struts, and stanchions.

Bending moment and shearing force diagrams. Stresses in beams and girders corresponding to given conditions of loading. The design of beams and girders.

Determination of stresses in the members of framed structures by means of reciprocal figures, and application to braced girders, and roof principals.

Details of the construction of brace girders, plate girders, and roof principals.

Design of riveted joints, pin joints, and bolted joints.

General design of the structure for a steel frame building.

Ferro-concrete with some of its simpler applications.

Design of retaining walls, fireproof floors, and deep foundations.

Candidates should be able to write a specification for any of the materials used in building construction, including iron, steel, and concrete, and they should also know the proper tests to apply to secure that the materials fulfil the specifications.

SUBJECT 11.—NAVAL ARCHITECTURE.

The students should be encouraged to make good rough sketches of the different parts of a ship's structure approximately to scale, using squared paper; they should also be impressed with the necessity of noting any detail of work brought before their notice daily in the shipyard. Questions will be set in the examination which require rough sketches of parts of a vessel to be given from memory.

If the class is held in an institution which possesses a testing machine, the students ought to be allowed to use it occasionally to test samples of materials used in shipbuilding.

All students should be provided with suitable scales, set squares, and ship curves, and candidates should bring these for use at the examination.

Tables of logarithms, functions of angles, and useful constants will be provided, and candidates will be restricted to the use of these tables, and will not be allowed to bring with them into the examination room any other Mathematical or Logarithm Tables. Slide rules may be used.

Compulsory questions may be set at the examinations.

Lower Examination.

I. PRACTICAL SHIPBUILDING.—The tests to which the various materials used in shipbuilding are subjected, and the defects to which those materials are liable; the tools and appliances used in ordinary shipyard work, and the general arrangement of blocks, staging, derricks, &c., used on a building slip; plans of flat and vertical keels, inner bottom, shell, deck and other plating; framing, beam, keelson, and stringer plans; watertight and other bulkheads; ceiling and wood decks; pillaring arrangements to secure clear holds, and details of cargo hatchways to meet Lloyd's Rules; rudders, stern frames, and spectacle arrangements for twin-screw ships; bilge keels; supports to engines, boilers, and shafting; masts and derricks; precautions necessary to prevent deterioration of the hull of a ship while building, and while on service; method of docking ships, how they are placed in position and supported.

II. LAYING OFF.—A knowledge of the work carried on in the Mould Loft for the purpose of fairing a set of lines, including traces of keelsons and longitudinals, edges of shell plating, tank margins, ribbands, &c., and transferring the frame and other lines to the scrive board; lifting the bevels and constructing round of beam mould; a ship's block model and the information necessary for its construction; obtaining the dimensions for ordering the shell plating, frames, beams, floors, inner bottom plating, &c.; making and marking ribbands; fairing the edges of shell plating on the frames; making templates or skeleton patterns for stem, sternpost, propeller bracket forgings or castings.

III. DRAWING.—Plotting of curves of displacement, tons per inch immersion, I.H.P., &c., from given data. A rough freehand dimensioned sketch may be given at the examination, requiring candidates to make finished scale drawings, and candidates will be expected to be able to draw, from their own knowledge, the fastenings suitable for connecting together the parts which are the subject of the example.

IV. SHIP CALCULATIONS.—Calculation of the weights of simple parts of a ship's structure; spacing and strength of iron and steel rivets; calculation of the strength of the simple parts of a ship's structure, such as tie plates, butt straps and laps; tons per inch immersion; change of trim, and moment to change trim; change of trim due to moving weights on board, and that due to the addition or removal of weights; the principles and use of Simpson's and other rules for finding the area and position of the centre of gravity of a plane area, and for calculating the position of the centre of buoyancy; graphic methods of finding displacement and position of the centre of buoyancy; curves of displacement and of tons per inch immersion; the fundamental conditions to be fulfilled in order that any body may float freely and at rest in still water; centre of flotation, metacentre, metacentric height, stable and unstable equilibrium; definitions of block, prismatic, water-plane, midship area, and other similar coefficients.

Higher Examination.

I. PRACTICAL SHIPBUILDING.—The structural arrangements necessary to resist longitudinal and transverse stresses to which ships are

liable in still water and amongst waves, and the arrangements to resist local stresses; description and rough hand sketches of detail fittings of ships, such as anchor and capstan gear, steering gear, and other appliances used in working a ship; davits and fittings in connection therewith; ventilating and coaling arrangements; pumping and draining; the fundamental types of vessels and modifications thereto, the distinctive features of such vessels and consequent effect on freeboard; methods of determining the sizes of structural parts and of detail fittings, making out midship sections to the Rules of the principal classification Societies for various types of vessels; methods of fitting up refrigerating spaces for shipment of frozen and chilled meat, fruit, &c.; construction of oil fuel bunkers, and of vessels for carrying oil; launching arrangements, and the diagrams and curves generally used in connection therewith.

II. Laying off.—Expanding the plating of longitudinals and margin plates by the geometric and mocking up methods; expanding stern plating, rudder trunking, and mast plating; obtaining the true shape of a hawse hole in the deck or shell, and similar practical problems; constructing and fairing the form of a twin screw bossing.

III. Ship Calculations.—Displacement sheet and arrangement of calculations made thereon; proofs of Simpson's and other rules for obtaining areas and moments; displacement and deadweight scales; approximate and detailed calculations relating to the weight and position of the centre of gravity of hull; calculations of weight and strength of parts of a ship's structure such as decks, bulkheads, framing, side and bottom plating, &c., also the strength of fittings such as boat davits, derricks, &c.; coefficients of weight of hull, outfit, and machinery for a few of the principal types of ships, also coefficients of position of the centre of gravity of the ships; curves of loads, shearing forces, and bending moments for a ship floating in still water, and amongst waves, also equivalent girder and stress in the material; calculations of the positions of transverse and longitudinal metacentres; consideration of the curves of centres of buoyancy, centres of flotation, and pro-meta-centres; the construction and use of metacentric diagrams; Atwood's and Moseley's formulæ, and methods of calculating stability based thereon; the construction and use of curves of stability; inclining experiment and the precautions that must be taken to ensure accuracy; change of draught and trim due to passing from fresh into salt water and vice versa; effect upon trim and stability due to flooding compartments of a ship; effect of free surface on the stability of vessels carrying liquid cargo; methods of determining the size of rudder-heads, and the stresses on rudders balanced and unbalanced; resistance of ships; Froude's experiments on skin friction; Froude's law of comparison for vessels at corresponding speeds; methods of calculating the horse-power to propel a vessel of known form at a given speed; effective horse-power, propulsive coefficient and Admiralty constants, and values of the two last in typical cases; speed of ships on trial, methods adopted and precautions necessary to obtain accurate speed data; progressive trials and their uses; elementary considerations of the oscillations of ships in still water and amongst waves; definitions of a "stiff" and "steady" vessel, and elements of design affecting these qualities; tonnage of ships, how measured, &c.

GROUP C.—PHYSICS.

SUBJECT 12.—HEAT.

Lower Examination.

Candidates will be expected to have an elementary knowledge of subsidiary subjects, such as Mathematics, Mechanics, Sound, Light, Magnetism and Electricity, so far as they relate to the subjects included in this syllabus. Simple problems may be set involving the application of elementary laws and formulæ. The candidate will be expected to have some practical acquaintance with simple forms of apparatus and methods of measurement and with the graphic representation of the results of observation.

THERMOMETRY. — Construction and graduation of thermometers. Sources of error of the mercurial thermometer, and simple corrections.

EXPANSION.—Solids—linear and cubical. Methods of measurement. Practical applications. Liquids—absolute and apparent expansion, methods of measurement. Gases—relation between pressure, volume and temperature. Gas thermometer at constant volume and constant pressure. Gas scale of temperature.

CALORIMETRY.—Units of heat. Specific and atomic heat. Calorimeters. Methods of measuring specific heats of solids, liquids and gases.

MECHANICAL EQUIVALENT OF HEAT.—Measurement of heat developed by friction. Ratio and difference of specific heats of gases. Adiabatic expansion. Method of Clement and Desormes. Calculation of the equivalent from the velocity of sound.

TRANSFERENCE OF HEAT—Conduction, convection and radiation. Conductivity. *Theory of Exchanges.* Newton's law of cooling. Stefan's law of radiation. Absorption, emission, and reflection of non-luminous radiation.

FUSION AND SOLIDIFICATION.—Melting-points. Latent heat. Ice calorimeters. Change of volume and effect of pressure.

VAPORISATION AND LIQUEFACTION.—Evaporation and ebullition. Spheroidal state. Pressure and density of saturated vapours. Dalton's laws. Hygrometry. Dew point and hygrometric state. Latent heat, total heat, and specific heat of steam. Steam calorimeter. Liquefaction of gases and vapours. Critical temperature.

ELECTRICAL THERMOMETRY.—General principles of galvanometer, thermocouple, thermopile, electrical resistance thermometer and bolometer.

Higher Examination.

The examination will consist of a written paper in which questions may be set on any branch of the subject, including thermo-dynamics and its relations to other departments of Physics. A knowledge of Higher Mathematics such as differential equations, Fourier analysis, &c., will not be regarded as essential, but it is most desirable that students should be acquainted with the elementary applications of the calculus to physical problems. Candidates will be expected to show knowledge of experimental methods and manipulation which cannot be obtained satisfactorily without laboratory training.

SUBJECT 13.—MAGNETISM AND ELECTRICITY.

Lower Examination.

Candidates will be expected to have an elementary knowledge of subsidiary subjects, such as Mathematics, Mechanics, Heat and Light, so far as they relate to the subjects included in this syllabus. Simple problems may be set, involving the application of elementary laws and formulæ. The candidate will be expected to have some practical acquaintance with electrical apparatus and methods, and with the graphic representation of the results of observation.

MAGNETISM.

PROPERTIES OF MAGNETS AND MAGNETIC SUBSTANCES.—Poles and axis of a magnet. Law of force between poles. Strength of pole. Unit pole. Magnetic moment. Intensity of magnetisation. Method of comparison of magnetic moments by oscillation and deflection.

MAGNETIC FIELD.—Strength of field. Lines of force. Methods of delineation. Field of a small linear magnet, end-on and broadside-on. Terrestrial magnetic elements, dip, declination, and horizontal force.

MAGNETIC INDUCTION.—Curves of magnetisation for soft iron and hard steel. Residual magnetism, coercive force, permeability. Molecular theory. Effect of temperature on a magnet. Critical temperature of iron. Diamagnetism.

ELECTROSTATICS.

ELECTRIFICATION BY FRICTION.—Positive and negative developed in equal quantities. Law of attraction and repulsion. Unit charge. Torsion balance. Gold-leaf electroscope. Conductors and insulators. Frictional machines.

ELECTROSTATIC INDUCTION.—Tubes or lines of force. Hollow conductors. Electric density. Action of points. Electrophorus. Influence machines.

ELECTROSTATIC ENERGY.—Work done in separating parallel plates with equal and opposite charges. Difference of potential. Electrometers. Capacity of parallel plate condenser. Leyden jar. Specific inductive capacity. Heat of electric discharge.

ELECTRIC CURRENT AND TECHNICAL APPLICATIONS.

PRODUCTION OF CURRENT BY CHEMICAL ACTION.—Types of voltaic cells. Constant or standard cells. Electromotive force. Definition of the volt by reference to Clark or Weston cell.

ELECTROLYSIS.—Polarisation. Voltameters. Calibration of ammeters by electro-deposition.

ELECTRIC CIRCUIT.—Ohm's law. Practical units and standards of resistance. Methods of measurement based on Ohm's law. Potential balance or potentiometer. Divided circuit. Wheatstone's bridge. Specific resistance. Variation of resistance with temperature. Electrical thermometers.

MAGNETIC MEASURE OF CURRENT.—Absolute definition of the ampère. Field at the centre of a circular coil. Tangent galvanometer. Astatic and moving coil galvanometers.

ELECTROMAGNETIC ENERGY.—Heating effect of current. Joule's law and its verification. Units of work and power. Thermoelectric currents.

MAGNETIC CIRCUIT OF ELECTROMAGNET.—Field inside a solenoid. Magnetic flux, magnetomotive force, and magnetic resistance.

ELECTROMAGNETIC INDUCTION.—Work done in moving a circuit carrying a current in a magnetic field. Induced electromotive force and current. Induction coil. Earth inductor. Ballistic galvanometer. Measurement of magnetic flux, and comparison of capacities.

TECHNICAL APPLICATIONS.—General principles of construction and description of simple forms of continuous current dynamos and motors; instruments used for measuring and testing; transmitters and receivers

employed in telegraphy and telephony; lines for transmission of electric signals or power; electric lighting by arc and incandescent lamps; electric meters, switches, keys, cut-outs, and accessory apparatus; methods of electro-deposition and simple electro-chemical processes; operation of storage batteries.

Higher Examination.

The examination will consist of a written paper in which questions may be set on any branch of the subject, in its relation to other branches of Physics. A knowledge of Higher Mathematics, such as differential equations, will not be regarded as essential, but it is most desirable that candidates should be acquainted with the elementary applications of the calculus to electrical problems. Candidates will be expected to show a knowledge of experimental methods and manipulation, which cannot be obtained satisfactorily without practical training in the laboratory.

GROUP D.—CHEMISTRY.

SUBJECT 14.—INORGANIC CHEMISTRY.

These examinations consist of written tests only,* but knowledge of practical chemistry will be tested both in the Lower and Higher Examinations by requiring candidates to describe, with all essential practical details, processes commonly carried out in the laboratory.

The outlines of laboratory work have been drawn up with the view of indicating the general nature of the laboratory training in Inorganic Chemistry which students should have received before presenting themselves for examination in this subject.

Compulsory questions may be set at the Examinations.

Lower Examination.

This syllabus prescribes the subjects of which a general knowledge is required; it does not prescribe the order in which they should be taught, but leaves this to the discretion of the teacher. So far as is possible the subjects of this syllabus should be illustrated by experiments, made either in the presence of the class by the teacher, or by the student in the laboratory, and a knowledge of the conditions under which the more important experiments can be made will be expected. It is most desirable that students should be trained to draw deductions from experiments they have made or have witnessed, instead of committing to memory conclusions drawn for them by their teacher or text-book.

The chief characteristics of chemical action, and the differences between chemical and physical changes. Distinction of mixtures, compounds and elements. The law of the conservation of matter.

Air studied as a mixture of (mainly) two gases. The relation of air to combustion. Removal from air of its active constituent. Isolation of this active constituent from air by means of mercury or litharge. History of the discovery of oxygen, and of the recognition of the part played by oxygen in ordinary combustion.

Water studied as a compound of two gases. Isolation of hydrogen from water by chemical means. Production of water by the combustion of hydrogen in oxygen or air. Production of water and the metal by heating a metallic oxide in hydrogen.

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* Examinations in Practical Inorganic Chemistry, as a separate subject, are, however, held for Scholarship candidates in the Competitive Examinations for Royal Scholarships, &c., and for Sir Joseph Whitworth's Scholarships and Exhibitions.

Oxygen and hydrogen studied as elements. Their preparation from common materials and their more important properties.

The physical properties of gases. Physical differences, such as colour, density, solubility, &c. between air and other gases. Effects of heat and of pressure on the volume of a gas. Reduction of gaseous volumes to standard temperature and pressure. Diffusion of gases.

Laws of chemical combination. The law of constant proportion. The law of multiple proportion. The law of combination of gases by volume. Determination of the composition of water by weight, and of steam by volume. Combustion of carbon and sulphur in oxygen without change of volume.

Theories of chemical combination. Dalton's atomic theory. Avogadro's hypothesis. The distinction between a law and a theory. Equivalents. Atomic and molecular weights. Molecular formulæ. Use of symbols and equations. Calculation of quantities by weight or volume from formulæ.

Classification of elements as metals or non-metals broadly from their physical properties, and from the properties of the compounds they form with oxygen and with hydrogen. Comparative study of groups of elements and their more prominent compounds, as illustrated by the alkaline earths, the nitrogen group and the halogens. Allotropy.

The properties of water as a solvent for solids, liquids and gases. The effects of dissolved substances on its physical properties—electrolysis. Outline of the theory of acids, bases and salts. Solvent action of water on metals. Hard and soft water.

Hydrogen peroxide and ozone. Their preparation, more important properties, and composition.

Nitrogen and its compounds with oxygen and hydrogen. Preparation, properties and composition of nitrous oxide, nitric oxide, nitrogen peroxide, nitric acid, and ammonia.

Atmospheric air, its principal constituents, and the methods by which their relative proportion can be ascertained.

The halogen group of elements: chlorine, bromine and iodine. Their occurrence, preparation and properties. Their hydrides, oxides and oxy-acids. Fluorine and hydrogen fluoride.

Carbon and silicon. Their occurrence in nature and properties. Their hydrides, chlorides, oxides and acids. Silicon fluoride. Methane, ethylene and acetylene as typical hydrocarbons. Homology.

Boron, boron trioxide, boric acid, boron fluoride.

Sulphur. Its occurrence in nature and properties. Its hydride, oxides and oxy-acids. Outline of the lead chamber and contact methods for the production of sulphuric acid. Catalysers, and their influence on the velocity of chemical interactions.

The nitrogen group of elements. Phosphorus, arsenic, antimony and bismuth. Their occurrence, preparation and properties. The compounds they form with chlorine, hydrogen and oxygen studied comparatively with those of nitrogen.

Metals and the chief sources from which they are obtained. Outline of chemical or electrical processes for the production of metals from oxides, carbonates, sulphides, or halogen compounds. The commoner alloys. The oxides, hydroxides and more important salts of the following metals:—

(i) sodium and potassium;
(ii) calcium, strontium and barium;
(iii) magnesium, zinc, cadmium and mercury;
(iv) aluminium;
(v) tin and lead;
(vi) chromium, manganese, iron, cobalt and nickel;
(vii) silver, gold, platinum, and copper.

The application, for the purposes of qualitative analysis, of differences in properties, solubility and the like of nearly related compounds.

Outlines of Laboratory Work.

(*a*) Simple quantitative experiments designed to illustrate the laws of chemical change, the nature of combustion, the composition of water and the determination of equivalents.

(*b*) Preparation of gaseous elements and compounds included in the syllabus for the Lower Examination and of simple and double salts in the crystallised state from metals, alloys and minerals.

(*c*) Qualitative recognition of simple substances.

(*d*) Volumetric determinations usually made with acid and alkali, permanganate and silver nitrate.

Higher Examination.

Candidates will be examined more fully upon the subjects included in the syllabus for the Lower Examination, and in addition upon the following subjects :—

Cyanogen, hydrocyanic acid and the cyanides. Cyanic acid and the cyanates. Ferrocyanides, ferricyanides and sulphocyanides (thiocyanates). The carbonyls of the metals.

Classification of the elements—the Periodic law—Valency. Relations between atomic weight and specific heat, and between atomic weight and crystalline form. Isomorphism—Methods of determining atomic weights. The value of vapour density determinations and modes of carrying them out.

Helium, argon, and the other inert gases of the eighth group. Radium and radio-activity ; their bearing on the nature of the atoms.

Spectroscopy, and its use in the identification of the elements. The more important general principles of physical chemistry. The laws governing the relation between the volumes and the pressures of gases. Van der Waals' equation. Dissociation of gases. Specific heat of gases at constant volume and constant pressure. Liquids, their nature and relation to gases ; critical phenomena and liquefaction of gases.

Osmotic pressure, its measurement and use in determination of molecular weights. The nature of solids. Determination of molecular weights by the lowering of the freezing point and rise in boiling point of solutions. Thermochemistry. Heats of formation and combustion, and their determination. Law of mass action. The Phase rule and examples of its application. Velocity of reaction. Catalysis. Electrolytic conductivity, electrolysis and electrolytic dissociation. The nature of solution. Hydrolysis.

Candidates will be required to have a general knowledge of the processes in use for the production of the following substances on the large scale, and to be able to illustrate their answers by sketches :—

Oxygen.
Chlorine, bromine, iodine.
Phosphorus.
Bleaching powder.
Sulphuric, hydrochloric and nitric acids.
Sodium carbonate, bicarbonate and caustic soda.
Lime.
Calcium carbide.
White lead.
Iron and steel.
Copper.
Lead.
Mercury.
Silver and gold.
Zinc.
Aluminium.
Sodium.
Cyanides.

Outlines of Laboratory Work.

(*a*) Qualitative recognition of the constituents of mixtures of inorganic substances, and of the more simple minerals.

(*b*) Gravimetric and volumetric determinations of the principal metallic and acidic radicals, including the analysis of a few typical alloys and minerals.

(*c*) Electrochemical methods for the preparation and analysis of inorganic substances.

(*d*) Calibration and use of apparatus for such physico-chemical operations as the determination of molecular weights, conductivity of solutions, velocity of reactions and spectra.

SUBJECT 15.—ORGANIC CHEMISTRY.

CHEMISTRY OF CARBON COMPOUNDS.

These examinations consist of written tests only,* but knowledge of practical chemistry will also be tested both in the Lower and Higher Examinations by requiring candidates to describe, with all essential practical details, processes commonly carried out in the laboratory.

The outlines of laboratory work have been drawn up with the view of indicating the general nature of the laboratory training in Organic Chemistry which students should have received before presenting themselves for examination in this subject.

Compulsory questions may be set at the Examinations.

Lower Examination.

This syllabus prescribes the subjects of which a general knowledge is required; it does not prescribe the order in which they should be taught, but leaves this to the discretion of the teacher. So far as is possible, the subjects of this syllabus should be illustrated by experiments, made either in the presence of the class by the teacher, or by the student in the laboratory, and a knowledge of the conditions under which the more important experiments can be made will be expected. It is most desirable that students should be trained to draw deductions from experiments they have made or have witnessed, instead of committing to memory conclusions drawn for them by their teacher or text-book.

Introduction.

Properties of the element carbon which render necessary the separate study of its compounds. Methods for the analysis of organic compounds, and for determining the molecular weights of volatile and non-volatile substances. Empirical, molecular, and structural formulæ. Homology and isomerism. Division of the subject into two parts for purposes of convenience—acyclic or aliphatic, and cyclic or aromatic compounds.

Acyclic or Aliphatic Compounds.

Methods by which petrol, alcohol, glycerol, chloroform, ether, acetic acid, tartaric acid, cane sugar, and glucose are manufactured. Methods by which the structure of typical acyclic compounds such as ethyl alcohol, ethyl ether, acetaldehyde, acetone, acetic acid, lactic acid, glycerol, tartaric acid and urea, has been determined.

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* Examinations in Practical Organic Chemistry, as a separate subject, are, however, held for Scholarship Candidates in the Competitive Examinations for Royal Scholarships, &c.

HYDROCARBONS.—Paraffins: methane, ethane, propane, and butane. Olefins: ethylene and propylene. Acetylene. Their preparation and distinctive characters.

HALOGEN DERIVATIVES.—Methyl and ethyl chloride, bromide, and iodide. Ethylene and ethylidene dichloride. Ethylene dibromide. Chloroform and iodoform. Carbon tetrachloride.

ALCOHOLS.—Monohydric alcohols: methyl, ethyl, propyl, and butyl alcohols. Primary, secondary and tertiary alcohols. Fusel oil. Rectified, proof and methylated spirit. Allyl alcohol. Polyhydric alcohols: glycol, glycerol, and mannitol.

ETHERS.—Methyl and ethyl ether.

ALDEHYDES AND KETONES.—Formaldehyde and acetaldehyde. Acetone.

ACIDS.—Monobasic acids: formic, acetic, propionic, butyric, palmitic and stearic acid. Acrylic acid.

Polybasic acids: oxalic and succinic acid.

Hydroxy-acids: glycollic, lactic, tartaric and citric acids; their preparation and distinctive characters.

Acetyl chloride, acetic anhydride and acetamide. Urea.

ESTERS.—Ethyl acetate and oxalate. Ethyl hydrogen sulphate. Common fats.

AMINES.—Methylamine and ethylamine. Primary, secondary, tertiary, and quaternary compounds.

CYANOGEN COMPOUNDS.—Hydrogen cyanide and potassium cyanide. Acetonitrile and methylcarbamine.

METALLIC COMPOUNDS.—Zinc methyl, magnesium methyl iodide, cacodyl.

CARBOHYDRATES.—Cane sugar, glucose, fructose, maltose, and starch.

CYCLIC OR AROMATIC COMPOUNDS.

Sources, manufacture and constitution of benzene, toluene, naphthalene, anthracene and phenol; of aniline, resorcinol, and phthalic acid; and of alizarin.

Chloro and nitro-derivatives of benzene and toluene. Benzenesulphonic acids.

HYDROXY-COMPOUNDS.—Phenol. Nitrophenols. Benzyl alcohol. Catechol, resorcinol and quinol.

AMINES.—Aniline and toluidine. Acetanilide, methyl and dimethylaniline. Benzenediazonium compounds. Phenylhydrazine.

ALDEHYDE.—Benzaldehyde.

ACIDS.—Benzoic acid and the phthalic acids. Cinnamic acid. Hydroxy-acids, especially salicylic acid.

NAPHTHALENE.—Nitronaphthalenes, naphthalenesulphonic acids, naphthols and naphthylamines.

ANTHRACENE.—Anthraquinone and alizarin.

OUTLINES OF LABORATORY WORK.

(*a*) Qualitative recognition of the elements usually present in organic compounds, and of radicals enabling such substances to be classified as alcohols, acids, amines, amides, aldehydes, ketones, unsaturated, nitro-derivatives, &c.

(*b*) Preparation in a pure state of not less than six organic compounds of different types.

(*c*) Fractional distillation, fractional crystallisation, determination of equivalents by gravimetric and volumetric processes.

Higher Examination.

Candidates will be required to show a competent knowledge of the chief groups of carbon compounds, both acyclic (aliphatic) and cyclic (aromatic), including those set out in the syllabus for the Lower Examination and the following :—

CARBONYL COMPOUNDS.—Ketones, ketonic acids, and quinones.

CARBOHYDRATES.—Synthesis of the sugars, and determination of their configuration. Glucosides. Starch.

POLYMETHYLENES (cycloparaffins) and their derivatives.

TERPENES, their derivatives and synthetical preparation.

CAMPHOR, its constitution, and the constitution of the acids produced by its oxidation.

PURINE GROUP.—Uric acid, theobromine, and caffeine.

PYRIDINE.—Synthesis of pyridine, of piperidine, and of coniine.

QUINOLINE.—Synthesis of quinoline and of *iso*quinoline.

DYE STUFFS.—Azo-dyes, magenta, eosin, and indigo.

ALKALOIDS.—Sources and chief properties of morphine, quinine, cinchonine, and strychnine.

Candidates will also be expected to answer questions set in connection with important problems in Organic Chemistry, including :—

Unsaturation in acyclic and cyclic compounds. Its recognition and interpretation.

Reduction of cyclic compounds, and especially of the phthalic acids.

Fermentation and enzyme actions.

Geometrical, optical, and dynamic isomerism.

Stereochemistry of nitrogen as shown in quaternary compounds and oximes.

Application of physical methods to the determination of structure.

OUTLINES OF LABORATORY WORK.

(*a*) Quantitative determination of the elements usually present in organic substances, and of such radicals as acetyl, methoxyl, carboxyl and the amino group.

(*b*) Preparation of a series of related organic substances, or the repetition of a portion of a published research involving the preparation of a series of related substances.

(*c*) Determination of molecular weights, molecular rotation, velocity of esterification, velocity of hydrolysis, and conductivity.

(*d*) Laboratory methods for the identification of organic substances.

GROUP E.—COAL MINING AND METALLURGY.

SUBJECT 16.—COAL MINING.*

Lower Examination.

Candidates for this Examination are expected to show a general knowledge of the principles of the subject, together with some knowledge

* This subject cannot be taken in any of the Competitions for Awards in Science.

of details in the matters of Design and Construction, but they will not be expected to enter into economic considerations. They should be able to make neat sketches in illustration of their answers.

Elementary Petrology; Tectonics of the earth's crust; Faults and other irregularities. Principles of stratigraphical Geology; succession of the Formations. Structure of principal British Coalfields.

Minerals worked under the Coal Mines Regulation Acts; various kinds of Coal, Bituminous coal, Anthracite, Lignite. Stratified Ironstone. Oil shale. Fireclay and Ganister.

Prospecting by means of surface indications and by boring; the simpler (English) percussion drill; the Diamond drill.

Tools and appliances for breaking rock and getting coal by hand and by machinery. Percussive and Rotary drilling machines. Coal-cutting machines. Transmission of power underground. Air compressors.

Blasting and Explosives; methods of charging and firing shots.

Adits and levels; the methods of driving and supporting the same in grounds of various character.

Shaft sinking and supporting shafts in ordinary ground, in heavily watered ground, and in running ground.

The laying out of Collieries and Ironstone Mines. Direction of main roads. Shaft pillars. Ordinary methods of working, bord and pillar, long wall, stall working. Methods of working very thick or highly inclined seams.

Underground transport, and the appliances used therefor. Hand-putting, horse tramming, self-acting inclines, mechanical haulage, locomotives of various kinds. The simpler calculations for underground transport.

Winding, and the appliances and fittings employed, such as winding engines, ropes, guides, pithead frames, cages, buckets, keps; safety appliances; onsetting and banking; balancing the load.

Drainage. Drainage adits. Siphons. Dams and flood doors. Appliances for winding water. Pumps of various kinds for permanent and sinking purposes. Various methods of actuating pumps.

Ventilation. Mine gases. Objects of ventilation. Natural ventilation. Artificial ventilation by furnace and mechanical means. Distribution of air. Regulation of air. Measurement of air currents. The simpler calculations affecting ventilation. Thermometer, Barometer and Hygrometer.

Illumination by candles, lamps, safety lamps, electric lamps.

Higher Examination.

In this Examination an accurate knowledge of details will be required, as well as a knowledge of economic considerations. Candidates should be able to illustrate their answers by dimensioned sketches.

A more complete knowledge of the subjects for the Lower Examination will be expected, together with the following additional matter:—

Leading features of the principal Colonial and Foreign Coalfields; statistics of production.

The various methods of percussive boring with ropes, rigid rods, and water flushing. Various methods of rotary boring. Surveying boreholes.

Management and organisation of labour in mines.

The theory of explosives; substitutes for explosives.

The setting out of straight and curved levels; maintaining gradient and direction.

Selection of shaft site and dimensions; organisation of sinking operations; surface arrangements for sinking. Inclined and rectangular shafts.

Details of special methods of laying out and working difficult seams; organisation of labour in coal getting. Hydraulic stowage.

Surface transport; colliery sidings; aerial ropeways.

Methods of electric winding; calculation of winding machinery; special methods of hoisting.

Calculation of pumping machinery; efficiency of various types.

Calculation of ventilating currents and machinery. Fan testing.

Arrangements of lamp cabins; testing lamps. Firedamp detectors.

Preparation of Minerals; tipplers, screens, picking belts and tables; ordinary methods of coal washing.

Design and construction of heapsteads and washeries. Special methods of cleaning coal. Loading coal.

Manufacture of coke and of bye-products; beehive, rectangular, retort and bye-product ovens; collection and purification of bye-products. Manufacture of patent fuel.

Ownership of Minerals. Royalties. Mineral leases. Mining Jurisprudence and Legislation.

Mine accidents, their statistics and classification. Gas and dust explosions. Recovery of Collieries after accidents. Rescue Appliances.

Surveying; general principles; use of chains and tapes; the cross-staff and optical square; the magnetic needle and miners' dial; dialling with loose and fast needle; levelling; the Theodolite; methods of Surveying and setting out used in Collieries and on Mineral properties.

SUBJECT 17.—METALLURGY.*

Section I.—The general properties of Metals. Fuels. Refractory Materials. Fluxes and Slags.

Section II.—Iron, Steel and Ferrous alloys.

Section III.—Non-ferrous metals.

Lower Examination.

Section I.

The physical properties of metals and alloys; methods of testing; influence of foreign elements. Chemical properties of metals. Mechanical properties of metals. Elementary principles of the microstructure of metals.

Classifications of fuels. Properties and applications of solid, liquid and gaseous fuels employed in metallurgical operations. Calorific power and intensity of fuel. Calorimetry and Pyrometry.

Theory of charcoal burning.

Coke burning in Beehive, Retort and Bye-product ovens.

Producer Gas, Water Gas, and various types of producers.

Refractory materials, Acid, Basic and Neutral; their compositions, properties and uses. Manufacture of fire bricks, crucibles and other appliances.

General principles of furnace construction and types of furnaces.

Selection and calculation of fluxes for ordinary smelting operations. Constitution and fusibility of silicates.

Definitions of common metallurgical terms.

Section II.

Physical properties of iron.

Influence of Carbon, Silicon, Manganese, Sulphur and Phosphorus on Iron.

* Examinations in Practical Metallurgy, as a separate subject, are held for Scholarship candidates in the Competitive Examinations for Royal Scholarships, &c., and for Sir Joseph Whitworth's Scholarships and Exhibitions.

Modes of existence of Carbon in Iron. Influence of Graphite (free carbon) and combined Carbon (carbide carbon) on the properties of iron.

Commercial ores of iron, their chemical and physical characteristics.

General principles and reactions governing the extraction of iron from its ores.

Pig Iron. Numbering or grading. Properties and composition.

Preparation of iron ores for smelting. Breaking and calcining.

General construction of modern blast furnaces. Influence of hot blast. Hot blast stoves. Composition and utilization of blast furnace gases. Composition and character of blast furnace slags.

Wrought or malleable iron. Puddling, Walloon and Lancashire-hearth methods. Shingling, re-heating and rolling. Production of puddled and merchant bars.

Steel. The physical properties and elementary micro-structure of steel. Cementation process. Furnaces and materials used. Blister steel. Shear steel.

Crucible steel. Production from "converted" or "cemented" bars and from "unconverted" bars. Coke and gas fired furnaces. Crucibles used.

The hardening, tempering and annealing of steel.

The Acid Bessemer process. The Basic Bessemer process. Principles of the respective processes. Convertors and appliances used. Products obtained. Utilization of basic slag.

The Open-hearth or Siemens process, Acid and Basic. Principles of the respective methods. Furnaces, linings and appliances used. Products obtained.

Composition of Spiegeleisen, ferro-manganese and ferro-silicon, and their uses in steel manufacture.

Ladles, ingot moulds and casting pits. Forging and rolling of steel.

Section III.

Lead. Physical and chemical properties of lead and its principal alloys.

Commercial ores of lead, their chemical and physical characteristics.

General principles and reactions governing the smelting and purification of lead.

Comparison of the chief methods of smelting. Calcination of lead ores.

Smelting in the ore hearth.

Smelting in the reverberatory furnace.

Smelting in shaft furnaces. The water jacket.

Products obtained, slags and fume.

Concentration of silver in work-lead by the Pattinson, Rozan and Parkes processes.

Hard lead and methods of softening.

Mercury. Physical and chemical properties of mercury and the principal amalgams.

Commercial ores of mercury, their chemical and physical characteristics.

General principles and reactions governing the extraction and condensation of mercury.

Comparison of the chief methods of extraction. Shaft and shelf furnaces and condensers. Products obtained.

Silver. Physical and chemical properties of silver and its principal alloys.

Commercial ores of silver, their chemical and physical characteristics.

General principles and reactions governing the extraction of silver by wet and dry methods.

Smelting of argentiferous lead ores.

Principles of cupellation; English and German processes.

Wet methods. Outlines of the Ziervogel and Augustin processes.

Roasting and chloridising. Roasting in reverberatory, rotating and shelf furnaces.

Amalgamation processes. Patio and pan amalgamation. Treatment of the amalgam.

Extraction of silver from argentiferous copper ores.

The Claudet process for the treatment of argentiferous pyrites.

Gold. Physical and chemical properties of gold and its principal alloys.

Commercial ores of gold, their chemical and physical characteristics.

General principles and reactions governing the extraction of gold by amalgamation and wet methods.

General construction of stamp mill; inside and outside amalgamation. Huntington and Chilian mills. Amalgamation in pans.

Treatment of amalgam and gold sponge.

Chlorination processes. Roasting in reverberatory furnaces. Chlorination in vats and barrels. Precipitation and collection of the gold.

Cyanide Process as applied to ores, tailings and slimes. Precipitation and treatment of the gold.

Refining and parting of gold bullion by sulphuric and nitric acids and by chlorine.

Platinum. Physical and chemical properties of platinum and its principal alloys.

Ores of platinum.

Melting and refining of platinum.

Copper. Physical and chemical properties of copper and its principal commercial alloys.

Commercial ores of copper, their chemical and physical characteristics.

General principles and reactions governing the smelting of copper.

Calcination of copper ores in heaps, stalls, shaft furnaces, reverberatory, mechanically worked, and rotating furnaces.

Copper smelting by the Welsh process and its modifications.

The German process of copper smelting.

Smelting in water jackets.

The Anglo-German process.

Bessemerising of copper matte.

Refining of coarse copper in hearths and furnaces.

Wet methods of copper extraction. Extraction and precipitation of the copper. Treatment of cement copper.

Zinc. Physical and chemical properties of zinc and its principal alloys.

Commercial ores of zinc, their chemical and physical characteristics.

General principles and reactions governing the extraction and condensation of zinc.

Calcination of zinc ores. The Belgian, Silesian, and Belgo-Silesian furnaces for zinc extraction. Ordinary forms of condensers.

Manufacture of sheet zinc.

Tin. Physical and chemical properties of tin and its principal alloys.

Commercial ores of tin, their chemical and physical characteristics.

General principles and reactions governing the smelting and refining of tin.

Preparation of ores for smelting.

Smelting in shaft furnaces.

Cornish method of smelting tin.

Products of smelting operations.

Liquation and refining.

Nickel. Physical and chemical properties of nickel and its non-ferrous commercial alloys.

Commercial ores of nickel, their chemical and physical characteristics.

General principles and reactions governing the extraction of nickel from its ores.

Extraction from sulphide and arsenical ores. Roasting, smelting, and concentration of matte and speiss.

Production of copper-nickel alloy and metallic nickel.

Aluminium. Physical and chemical properties of aluminium and its commercial alloys.

Commercial sources of aluminium.

General principles and reactions governing the extraction of aluminium.

Higher Examination.

For the Higher Examination a more advanced and precise knowledge of the subjects included in the Syllabus of the Lower Examination will be required, together with the following additional subjects; candidates will be expected to illustrate their answers, whenever possible, by neat and accurate sketches.

Candidates must answer questions in Section I., and may select either Section II. or Section III., but may not answer questions from both the latter sections.

Section I.

Appliances and methods for testing under tensile, compressive, transverse, torsional and alternating stress; hardness tests. Micrography of metals and alloys. Constitution of alloys; solid solutions; eutectics; cooling and freezing point curves; equilibrium diagrams; the phase rule; allotropism.

The effect of temperature upon metals and alloys; heat treatment; hardening and annealing. Soldering and welding.

The corrosion of metals and alloys.

Principles of Thermo-chemistry. Details of construction of pyrometers and calorimeters.

Modern bye-product coke-ovens; the collection and utilisation of bye-products.

Electric furnaces of various types. Electrolysis and its applications to the extraction and purification of metals.

Calculation of furnace charges. Constitution and micro-structure of slags.

Section II.

Physical properties of Iron. Idiomorphic and allotrimorphic crystals; cleavage; absorption and recalescence curves of pure iron.

Modern researches on the hardening and tempering of Steel.

Correlation of tempering colours with temperatures.

Micrographic investigations; influence of Carbon on Iron, including absorption (heating) and recalescence (cooling) curves, mechanical tests, micro-structure.

Micro constituents and transition areas observed in iron and steel. Mechanical properties and micro-structures of alloys of almost pure iron and silicon, iron and manganese, iron and chromium, and mechanical properties of the alloys of almost pure iron and nickel. Influence of copper and arsenic on iron and steel. Typical chemical compositions, mechanical properties and micro-structures of Swedish or other equally pure wrought iron, Swedish and British cast irons, and of English and Black heart malleable cast irons.

Micrographic influence of Phosphorus on structure of cast iron. Expansion curves of typical cast irons. Micro-structure of Blister Bar or cemented wrought iron.

Details of production of blister steel, shear steel and double shear steel.

Crucible steel. Reactions taking place in the manufacture of crucible steel by Huntsman's process. Compositions or tempers of steels suitable for making typical tools, from about 0·6 to 2·6 per cent. of carbon.

Evolution from plain carbon tool steels (*a*) of self-hardening steel, (*b*) of high-speed steel.

Relative parts played by Bessemer and Mushet in the development of the Bessemer process. Effects of heat treatment on English Bessemer steels. A comparison of the English, Swedish, and American Bessemer processes.

Development of the Open Hearth process in Britain. Steel Castings. Chemical composition, mechanical properties and micro-structure as cast and after annealing.

Mechanical Testing. Stress-strain diagrams obtained in static tensile testing. Analysis of diagrams. Present position of dynamic or kinetic testing. Cycles of stress in the Wohler and in the Arnold methods.

Composition of metallic manganese, chromium, tungsten, molybdenum, nickel and aluminium used in steel manufacture. Compositions of ferro-chromium, ferro-tungsten and of ferro-vanadium.

Pipes and blow-holes in steel. Composition of the contained gases. Killing of steel. Influence of Manganese, Silicon and Aluminium. Liquation and segregation in steel.

Diffusion of elements in iron. Diffusion and segregation of carbide of iron at various temperatures.

Carbides of steel and iron alloys.

Statistics of the production of iron and steel in the most important countries.

Analysis of iron ores, iron, steel, and the more important metallurgical products.

Section III.

A knowledge of sampling and assaying of ores, metals, and metallurgical products will be expected, also statistics of production of the more important metals.

Lead. Treatment of antimonial lead ores and of zinciferous complex ores. Treatment of cupriferous lead mattes.

Blast-roasting (Huntington-Heberlein, Savelsberg, Bradford-Carmichael, Dwight-Lloyd, and other processes).

Collection and treatment of lead fume.

Manufacture of white lead and sublimed white lead.

Electrolytic lead refining. Manufacture of sheet lead and lead pipe.

Silver. Wet methods of extraction, Patera, Kiss, Russell, and similar processes. Cyanide processes.

Mechanical roasting furnaces.

Special amalgamation processes, *e.g.*, Cazo, Fondon, Kröhnke, Tina processes. Boss continuous process. Roast-amalgamation processes in barrels and pans.

Treatment of silver bullion.

Treatment of silver slimes from electrolytic refining.

Gold. Various crushing and grinding appliances; tube mills.

Bromination processes.

Modifications of cyanide process.

Treatment of auriferous anode mud.

Treatment of gold "sweep"; refining of brittle gold.

Copper. Pyritic smelting. Electrolytic processes for ore and matte. Electrolytic refining.

Treatment of Lake Superior ores.

Best-selecting process; treatment of copper bottoms.

Rolling of copper and its more important commercial alloys.

Zinc. Various forms of condensers. Treatment of zinc fume and "blue powder."

Electrolytic extraction of zinc; electrothermic extraction.

Manufacture of zinc white and analogous products.

Galvanising.

Cadmium. Physical and chemical properties of cadmium and of its principal alloys. Sources of cadmium. Extraction of cadmium.

Tin. Modifications of the Cornish method of smelting.

Treatment of tin-plate scrap; manufacture of tin-plate.

Nickel. Mond process; converter process; electrolytic processes.

Refining of coarse nickel.

Aluminium. Preparation of aluminium compounds from bauxite.

Extraction of aluminium by means of sodium and magnesium.

Electrothermic processes. Preparation of aluminium alloys.

Cobalt. Commercial ores of cobalt, their chemical and physical characteristics. Metallurgical products containing cobalt.

The manufacture of Smalts and Cobalt oxide.

Antimony. Physical and chemical properties of antimony and of its principal alloys.

Commercial ores of antimony, their physical and chemical characteristics.

Liquation processes; production of crude antimony; production of regulus (metallic antimony); refining of antimony.

Arsenic. Physical and chemical properties of arsenic.

Commercial ores of arsenic, their physical and chemical characteristics.

The manufacture and refining of white arsenic; manufacture of other commercial compounds of arsenic.

Bismuth. Physical and chemical properties of bismuth.

Commercial ores of bismuth, their physical and chemical characteristics.

Extraction of bismuth from ores and metallurgical products, by dry and wet methods. Refining of bismuth.

SYLLABUSES UPON WHICH COMPETITIVE EXAMINATIONS FOR AWARDS IN SCIENCE, BUT NOT GENERAL EXAMINATIONS, WILL BE HELD IN 1914.

SOUND AND LIGHT.

Lower Examination.

SOUND.

WAVE-MOTION AND VIBRATION.—Relations between amplitude, period, frequency, phase, wave-length, energy, and velocity. Wave-front and ray. Longitudinal and transverse vibrations and waves. Simple harmonic vibrations and sine waves. Composition and resolution of vibrations. Lissajou's figures.

VELOCITY OF SOUND.—Measurement and calculation of the velocity of sound. Newton's formula and Laplace's correction. Effect of change of temperature on the velocity in a gas. Reflection and refraction of sound waves. Doppler's principle.

VIBRATIONS of strings, rods, and columns of air, Tuning-forks. Harmonics. Vibrations of plates. Chladni's figures. Maintenance of vibrations by heat.

MUSICAL SCALE.—Temperament. Concord and discord.

INTERFERENCE OF SOUND-WAVES.—Stationary waves. Beats. Measurement of wave-length and frequency. Resonance. Combination tones. Analysis of compound tones.

LIGHT.

RECTILINEAR PROPAGATION OF LIGHT.—Rays and shadows. Pin-hole camera. Measurement of velocity. Photometry.

LAWS OF REFLECTION AND REFRACTION.—Index of refraction. Total internal reflection. Explanation on wave-theory. Formation of images by plane and spherical surfaces, prisms, mirrors, and lenses. Parabolic mirror. Spherical aberration. Caustics.

OPTICAL INSTRUMENTS.—Camera, optical lantern, telescope, microscope, spectrometer, goniometer, sextant.

DISPERSION.—Dispersive power. Achromatism. Spectrum analysis. Absorption spectra. Colour vision.

INTERFERENCE AND DIFFRACTION.—Colours of thin plates. Newton's rings. Fresnel's bands. Diffraction grating and spectrum. Measurement of wave-length.

POLARIZATION.—Double refraction. Tourmaline and Iceland spar. Polarization by reflection. Nicol's prism. Rotation of plane of polarization. Simple forms of polariscope and saccharimeter.

Candidates will be expected to have an elementary knowledge of subsidiary subjects, such as Mathematics, Mechanics, Heat, Electricity, and Magnetism, so far as they relate to the subjects included in this syllabus. They must also have some practical acquaintance with simple forms of apparatus and methods of measurement, and with the graphic representation of the results of observation.

SOUND AND LIGHT.

Higher Examination.

The examination will consist of a written paper in which questions may be set on any branch of the subject and its relations to other branches of physics. A knowledge of higher mathematics such as differential equations, Fourier analysis, &c., will not be exacted as essential, but it is most desirable that the student should be acquainted with the elementary applications of the calculus to physical problems. Candidates will be expected to show some experience of the details of practical work and manipulation, which cannot be obtained satisfactorily without laboratory training.

PRACTICAL INORGANIC CHEMISTRY.

Compulsory questions may be set at the Examinations.

Lower Examination.

The examination will consist of two parts:—

I. A short written examination with the object of testing the candidate's knowledge both of the theory of ordinary methods of qualitative analysis and of the preparation of such substances as are enumerated in the Syllabus for the Lower Examination in Theoretical Inorganic Chemistry (Subject 14).

II. A practical examination in Experimental Chemistry.

A.—One or two substances may be given for qualitative analysis, each containing not more than four radicals, positive or negative, selected from the following list: Silver, lead, mercury, copper, bismuth, cadmium, tin, arsenic, antimony, iron, manganese, aluminium, chromium, zinc, cobalt, nickel, calcium, strontium, barium, magnesium, potassium, sodium, ammonium, chlorides, bromides, iodides, fluorides, sulphides, sulphites, sulphates, chromates, carbonates, phosphates, arsenates, borates, silicates, nitrates, nitrites, chlorates, permanganates.

There might, therefore, be four metals in the form of oxide, or three metals in the form of the same salt, or two simple salts or one metal in the form of three salts.

B.—One substance may be given to be tested quantitatively by means of a volumetric solution provided.

C.—Candidates may also be required to carry out experiments with the object of testing their knowledge of the laws and methods of chemistry not included among the ordinary methods of analysis. For these, instructions will be given in the paper.

Four hours will be allowed for the examination in practical work and one hour for the written examination.

NOTE.—The use of note-books, text-books, or works of reference is permitted during the practical part of the examination in the Laboratory.

Higher Examination.

The examination will occupy one day of eight hours.

SUBJECTS.—1. Qualitative analysis, in which substances will be given which must be examined for the radicals contained in the list given above for the Lower Examination.

2. Gravimetric and volumetric analysis by any well-recognised methods.

3. Gas analysis, and analysis of minerals and commercial metals.

4. Preparation of pure substances or carrying out other well-recognised operations.

The use of note-books, text-books, or works of reference is permitted.

PRACTICAL ORGANIC CHEMISTRY.

CHEMISTRY OF CARBON COMPOUNDS.

Compulsory Questions may be set at the Examinations.

Lower Examination.

The examination will consist of two parts:—

I. A short written examination with the object of testing the candidate's knowledge both of the principles of the analytical processes and of the methods of preparing and demonstrating the properties of such substances as are enumerated in the Syllabus for the Lower Examination in Theoretical Organic Chemistry (Subject 15).

II. For the practical examination, the student will be required to be familiar with the methods of detecting carbon, hydrogen, nitrogen, sulphur, chlorine, bromine, and iodine in carbon compounds, and to make himself practically acquainted with the determination of melting and boiling points. He must also be acquainted with the reactions of, and tests for, the following substances, and will be required to recognise by physical characters and chemical tests two or more of the following compounds in a pure state or in solution, or, in the case of acids or bases, in the form of salts:—

Methyl alcohol, ethyl alcohol, chloroform, iodoform, ethyl iodide, ethyl bromide, ethyl acetate, formaldehyde, acetaldehyde, acetone, formic acid, acetic acid, oxalic acid, glycerol, tartaric acid, citric acid, urea, hydrocyanic acid, cane sugar, glucose, lactose, starch, benzene, toluene, naphthalene, anthracene, phenol, resorcinol, aniline, benzaldehyde, benzoic acid, salicylic acid, phthalic acid. He may also be required to refer, without identification, unknown compounds to one or other of the following classes:—Alcohols, aldehydes, acids, ketones, amides, amines, esters, phenols.

III. Quantitative work, such as estimation of molecular weights of acids and bases.

He may also be required to prepare specimens of familiar compounds from materials supplied.

The use of note-books, text-books, or books of reference is permitted during the practical part of the examination in the Laboratory.

Three and a quarter hours will be allowed for the examination in practical analysis, and one hour for the written examination.

Higher Examination.

The examination will occupy one day of eight hours, and will include the recognition of single substances in the solid or liquid state or in solution; the separation and identification of the constituents of mixtures of two or more substances possessing well-marked characteristics; the preparation of specimens; and quantitative work, such as the estimation of halogens, of nitrogen or of acetyl or methoxyl groups, and of molecular weights.

The use of note-books, text-books, or works of reference is permitted.

PRACTICAL METALLURGY.

Lower Examination.

Five hours will be allowed for the examination. The use of note-books, text-books, or works of reference is permitted.

Candidates will be required to work a small number of exercises, the subjects of which will be selected from the matter indicated below.

Fuel.—Coal. Determination of coke and ash. Determination of the calorific power of coal with the aid of Thompson's calorimeter.

Refractory Materials.—Testing of fire-clay and other refractory materials, fire-bricks, and crucibles, with a view to ascertaining, first, their capability of sustaining a high temperature; and second, their power of resisting the corrosive action of fused metallic oxides. The preparation of small clay crucibles from a material consisting of two parts by measure of unburnt to one part of burnt Stourbridge clay. The preparation of cupels of bone ash.

Reagents and Fluxes.—The action and uses of the common reagents and fluxes employed in assaying. Experiments demonstrating their general properties.

Alloys.—The preparation of common alloys, such as pewter, brass, and bronze, of which the chemical, physical or mechanical properties differ widely from those of their constituent metals. The copper-zinc alloys; various kinds of brass; the copper-tin alloys, speculum metal and gun-metal; the tin-lead alloys (with or without other metals), fusible metal. The preparation of "Regulus of Venus" (copper and antimony in equal parts by weight).

Metals.—Effects of foreign substances on the mechanical properties of metals.

Methods adopted in the Extraction of Metals from their Ores.

Roasting.—Principles of roasting: conversion of metallic sulphides into oxides and sulphates by roasting in the muffle furnace, especially copper, lead and zinc sulphides. Estimation of the amount of compounds soluble in water produced by roasting certain mixtures of metallic sulphides such as argentiferous copper matters.

Reduction.—Principles of reduction.—The reduction of iron oxide by the heating of hæmatite in small clay crucibles, or in crucibles lined with charcoal, suitable fluxes and reducing agents being added.

Reduction of copper oxides and of lead oxides by carbon.

Reduction of lead sulphide by the mutual action of the sulphide and oxide.

Reduction of copper from copper sulphide by the action of the sulphide on copper oxide. In these cases the mixture is so adjusted that the relation between the sulphur and oxygen shall be the same as in sulphur dioxide.

Reduction of lead sulphide by metallic iron.

Reduction of copper silicates by fusion with iron oxides or lime, and charcoal.

The fusion of copper silicates with iron sulphides.

Reduction of lead silicates.

The production of coarse metal, white metal, and metallic copper from copper pyrites.

CEMENTATION (OXIDIZING AND CARBURIZING).—The leading effects that attend (1) the prolonged heating of thin pieces of cast-iron in hæmatites, and (2) the prolonged heating of wrought-iron in charcoal.

SCORIFICATION AND CUPELLATION.—The general features of the enrichment of argentiferous lead by scorification in a muffle with subsequent separation of the silver by cupellation on a bone-ash cupel. The behaviour of tin, antimony and zinc, and of copper-zinc and copper-nickel alloys when cupelled and when scorified with lead.

PURIFICATION OF METALS.—DRY METHODS.—Refining copper by oxidizing and "poling" commercial copper melted in a crucible. The candidate should be familiar with the characteristics of the ingot of metal in the three states known as:—(1) "dry copper"; (2) "tough copper"; (3) "overpoled."

SLAGS.—Experiments on their formation.

AMALGAMATION.—Action of metallic mercury when triturated with metallic silver, artificially prepared silver sulphide, and silver chloride; separation of the amalgam formed in each case; its concentration by squeezing in leather, and subsequent distillation.

LIQUATION.—Separation of native antimony sulphide from its gangue.

Higher Examination.

The examination will occupy eight hours.

The use of note-books, text-books, or works of reference is permitted.

Candidates will be required to work a small number of exercises, the subjects of which may be selected from the syllabus for the Lower Examination or from the additional matters specified below.

CHLORINATION, &c.—Formation of gold chloride by the action of chlorine gas on finely divided gold. Solution of the chloride in water, and the precipitation of the gold by ferrous sulphate.

Treatment of auriferous iron pyrites by roasting with salt; conversion of the compound so formed into finely divided gold by an elevation of temperature, and subsequent conversion of the gold into chloride soluble in water by the action of chlorine gas. Recovery of the gold from solution by precipitation with ferrous sulphate.

Preparation of silver chloride. Solution of the silver chloride in brine, and separation of the metal from solution by metallic copper.

Treatment of copper pyrites by roasting with common salt, and subsequent extraction of the soluble copper chloride by water.

Treatment of pyrites mixed with silver sulphide by roasting with common salt, and estimation of the amount of silver that has been converted into chloride as shown by the solvent action of sodium hyposulphite and sodium chloride respectively.

Treatment of argentiferous copper matte by roasting, and estimation of the amount of silver which has been converted into sulphate as shown by the solvent action of hot water.

PURIFICATION OF METALS.—Separation of copper alloyed with silver and gold by "parting" with sulphuric acid, recovery of the silver from solution by metallic copper, and of the copper from the copper sulphate so formed, by metallic iron.

Separation of gold from silver by "parting" with nitric acid; recovery of the silver by precipitation as chloride, and its subsequent reduction to the metallic state by zinc or iron.

Refining crude copper.

The production of copper "bottoms" from auriferous copper regulus.

The precipitation of gold from solutions.

The estimation of the chief metals in common ores, metallurgical materials and products, by dry and wet methods.

The determination of the suitability of coal and coke for use in specified metallurgical operations.

The estimation of silica, lime and iron in slags, and of silica in acid refractory materials.

The estimation of lime and magnesia in basic refractory materials.

The estimation of iron, gold, silver, copper, zinc, lead and tin in the common alloys in which these metals occur.

The preparation of chemically pure gold and silver.

IRON AND STEEL.

The estimation of carbon, silicon, sulphur, phosphorus, and manganese in cast iron and in steel.

Hardening, tempering and annealing steel.

LABORATORY ARRANGEMENTS FOR PRACTICAL METALLURGY.

In most cases comparatively small additions to the Chemical Laboratories, arranged and furnished in accordance with the prescribed regulations, will enable the Board to allow an examination in Practical Metallurgy to be held.

It is necessary that one or more wind furnaces should be provided, and these furnaces should be in connection with a flue at least 30 feet high. The furnaces may be placed in a basement below the laboratory, but there is no objection, if space permits, to one being in the laboratory.

There must also be a muffle furnace capable of heating to a bright redness a muffle at least 8 inches long, 4 inches wide, and 3 inches high. when there is an abundant supply of gas, gas muffle furnaces may be adopted with advantage.

Not more than three candidates will be allowed to use the same muffle furnace at any examination in Practical Metallurgy.

The muffle furnace may be in the laboratory, as it is also useful in conducting various chemical operations.

Each candidate should be provided with the tools and appliances set forth in List I., and those named in List II. must be kept in the laboratory. List III. gives the reagents, fluxes, &c., that will be required for general use.

List I.

Each candidate must be provided with the following articles:—

1 small hammer.
1 small anvil.
1 drill.
1 steel spatula.
1 camel hair brush.
1 hard tooth brush.
2 sheets of glazed paper.
1 pair of scissors.
1 pair of pliers—half round, taper.
1 pair brass forceps.
1 triangular file.
1 wire triangle—covered.
2 glass rods.
1 glass funnel, 3 inches in diameter.
4 beakers, Nos. 5, 6, 7 and 8.
1 washing bottle fitted.
2 conical flasks and small funnels.
2 Bohemian flasks, 24 ozs.
1 Berlin evaporating dish, No. 7.
1 Berlin evaporating dish, No. 2, 3½ inches diameter.
1 porcelain mortar.
1 porcelain crucible, 1½ inch diameter.
1 packet of filters, 5½ inches diameter, or filtering paper.
6 test tubes.
2 feet combustion tubing.
1 lens.
6 scorifiers, 2½ inches diameter.
12 cupels.
6 earthen crucibles, each size, 1¾, 2½, and 3 inches diameter.
1 black-lead crucible, 3 inches diameter.
2 roasting dishes, 3 inches diameter.
1 duster or cloth.
1 note-book.
½ oz. silver, or old or foreign silver coin.
2 dwts. gold, or old or foreign gold coin.

List II.

The following must be kept for general use:—

3 pairs of furnace tongs.
1 open ingot mould.
1 ingot mould with hemispherical cavities.
1 copper scoop.
1 cupel mould.
1 mould for making small clay crucibles.
2 iron cupel trays.
1 iron mortar.
1 anvil, 4 inches by 4 inches.
1 hammer.
1 pair of metal shears.
1 pair of flatting rolls.
1 bucking plate and iron.

List III.

The following metals and reagents, which need not be of a high degree of purity, must be kept, in addition to the ordinary stock of a chemical laboratory:—

Antimony.
Arsenic.
Bismuth.
Copper.
Iron (hoop and wire).
Nickel.
Charcoal.
Sulphur.
Antimony sulphide (black).
Bismuth oxide.
Copper oxide (black).
Copper sulphate.
Cobalt oxide.
Iron oxide.
Litharge.
Red lead.
Lead sulphate.
Manganese oxide (black).
Mercury sulphide (red).
Lead (in thin sheet free from silver).
Mercury.
Tin.
Zinc.
Tin oxide.
Zinc oxide.
China clay.
Glass, powdered.
Lime.
Salt.
Fireclay.
Siliceous sand.
Fluorspar.
Red argol.
Borax.
Dry sodium carbonate.
Potassium cyanide.
Potassium nitrate.

GENERAL BIOLOGY.

N.B.—The tests may include the description, drawing, and interpretation of simple natural objects not named in the syllabus.

Compulsory questions may be set at the Examination.

1. Unicellular organisms. The form, size, and structure, the modes of growth and multiplication, and the conditions and results of the living activity of Saccharomyces, Chlamydomonas, Euglena, and Amœba.

2. The Earthworm (Lumbricus). The general structure of the earthworm; the division of the body into segments or somites. The mode of life of the earthworm; the action of earthworms in the formation of vegetable mould.

3. The Crayfish (Astacus). The general structure of the crayfish, and its mode of life. The exoskeleton and its several parts; the mode of growth; the appendages; their common plan, and their adaptations to special purposes (any intelligible method of denoting the appendages and their parts will be accepted). The structure, arrangement, and mode of action of the several organs; and especially the digestive, circulatory, respiratory, and nervous systems.

4. The general structure and the life histories of some common Insects. The Cabbage White Butterfly, the Tiger Moth, the Silkworm Moth, and Chironomus should be studied and drawings and notes made of the transformations. The common house-fly and the cockroach should also be examined.

5. The Dog-fish (Scyllium). The general structure and mode of life of a dog-fish. The external characters; the scales and teeth; the fins. The chief features, but not the details, of the skeleton of the dog-fish.

The structure, arrangement, and mode of action of the several organs; and especially the digestive, circulatory, respiratory, and nervous systems. The main points of resemblance and of difference between a dog-fish and a frog.

6. The general anatomy of a Frog. The skeleton of the frog; its component parts, and their uses and relations to other organs. The structure and arrangement of the digestive, circulatory, respiratory, excretory, and nervous systems of the frog, and the uses and modes of action of the several parts (including the sense organs). The characters of the blood-circulation as seen in the web of a frog's foot. Arteries, veins, capillaries. The blood corpuscles, red and white. The uses of the blood, and the modes and places in which these are effected.

7. The outlines of the development of the Frog. The formation of the eggs. Fertilisation and segmentation of the eggs. The development of the tadpole, and especially of its nervous system and alimentary canal. The respiratory organs and the method of breathing of the tadpole. The changes that occur during the metamorphosis of the tadpole into the frog.

8. The General Structure of a Bird.—The feathers, wing, beak, and other external features should be carefully examined. The skeleton should be studied, especially in relation to support and locomotion. Very few technical terms are required; the chief thing is to form a clear mental picture of the structures and of their special adaptations.

9. Some Common Quadrupeds.—The external features and mode of life of the cat, dog, rabbit, mouse, horse, sheep, and bat should be observed, *e.g.*, hair or fur, eyes and ears, teeth, hoofs or claws, food, modes of locomotion, likes and dislikes, habitations, &c. A skeleton of one of these animals should be accessible, and its chief peculiarities should be pointed out.

10. Elementary Physiology.—Very elementary lessons should be given on digestion, circulation, and respiration. A sheep's heart should be dissected, and other simple dissections and experiments can be shown.

11. The structure and life-history of a Bean or other Flowering Plant. The structure, including the minute structure, of the stem, the root, and the foliage leaf in connection with their functions. The structure of the flower; the calyx, the corolla, the andrœcium, the gynæcium; the floral leaves, sepals, petals, stamens, and carpels; the nectaries. The structure of the anther; the pollen sacs and the pollen grains. The structure of the ovary; the ovule, and the embryo-sac with its contents. The processes of pollination and fertilisation; the products of fertilisation; the fruit; the seed.

12. The general character of the vegetation found in such localities as a roadside, hedgerow, bank of a river, pond, or canal.

13. The identification of common trees, oak, ash, beech, sycamore, horse-chestnut, elm, poplar, alder, willow, birch, hazel, and hornbeam, by means of twigs, buds, bark, leaves, &c.

14. The pollination and fertilisation of flowering plants. The formation of the fruit and seed.

15. The germination of seeds, including the conditions necessary to germination, and the chemical changes involved. The food-reserves of seeds and the changes which they undergo during germination.

16. The vegetative reproduction of flowering plants.

17. The structure and life-history of a Fern (Pteris). The general structure of the sporophyte in connection with its mode of life. Sporangia and spores. The structure and development of the prothallium. The sexual reproductive organs and the early stages of development of the sporophyte.

18. The structure and mode of life of Cystopus (Albugo) candidus. Its methods of reproduction and dispersal.

19. The physiology of the flowering plant. The physiology of nutrition in connection with the presence of chlorophyll; the absorptive, assimilative, and transpiratory organs; conduction of liquid from the roots to the leaves; transpiration; the distribution of the organic substances formed in the leaves.

Experimental proof of the following:—

(*a*) Starch-formation in green plants supplied with carbon dioxide and sunlight. Starch prints in leaves.

(*b*) The uses of dissolved salts in the nutrition of green plants. (Water cultures.)

(*c*) The path by which water ascends to the leaves (removal or obstruction of systems of tissue in a living woody stem).

20. The responses of plants to external stimuli, light, contact, and gravity.

21. Comparison of the nutritive processes of green plants, fungi, and animals. The way in which plants aid the nutrition of animals, and animals the nutrition of plants.

22. The chief distinctive characters of plants and animals.

HUMAN PHYSIOLOGY.

Lower Examination.

Candidates are expected to have studied practically the undermentioned points in the elements of Anatomy and Physiology. They will be asked to describe in the written examination the chief facts brought out by experiments and observations, which have been either demonstrated by the teacher or carried out by themselves.

Compulsory questions may be set at the Examinations.

a. The General Build of the Body.

The form and relative positions of the following parts of the skeleton:—Skull, vertebræ, ribs, sternum; scapula, clavicle, humerus, radius, ulna, carpus, metacarpus, phalanges (of the hand); pelvis, femur, tibia, fibula, tarsus, metatarsus, phalanges (of the foot).

The position in the body, and the general form of the following internal organs:—The brain and spinal cord; the pharynx, gullet, stomach, and intestines; the salivary glands, the liver, and the pancreas; the posterior nares, the larynx, trachea, and lungs; the diaphragm; the kidneys and the bladder; the heart and the great vessels.

b. The Blood and Lymph.

The size, form, relative number, structure and functions of the corpuscles of the blood and lymph.

The general composition of the blood. The nature of the process of blood clotting.

The function of the blood. The colouring matter of the blood and its principal derivatives.

The microscopic characters and chemical composition of lymph.

c. The Heart, Blood Vessels and Lymphatics.

The structure of the heart in the Frog and in the Mammal. The action of the heart in propelling the blood. The course of the circulation and the reason why the blood moves in only one direction. The general

character of the blood-flow in arteries, capillaries, and veins. The evidence of the circulation obtainable in the living body. The general distribution of the principal arterial and venous trunks. The minute structure of the heart, arteries, veins, and capillaries.

The variations in the intraventricular blood pressure. The action of the valves of the heart. The sounds of the heart; the use of the stethoscope. The cardiograph and its record.

The mechanics of the circulation. Blood pressure, arterial, venous and capillary. The circumstances determining the rate of blood-flow. The phenomena of the pulse. The sphygmograph and its record. The character and causation of the venous blood-flow. The structure and functions of the spleen.

The nervous supply of the heart in the Frog and in the Mammal; the influence of the vagus and sympathetic nerves on the heart.

The influence of the nervous system on the blood vessels; vaso-motor centres and nerves.

The structure of the lymphatic vessels and glands, and the connection of the lymphatic with the blood vascular system. The origin of the lymphatics. The causes which determine the amount of lymph present in the lymphatic spaces, and those which determine the flow of lymph along the lymphatic channels.

d. Food, Digestion and Absorption.

The arrangement of the alimentary canal. The structure and functions of the salivary glands. The œsophagus; the structure of its walls. The stomach; its glands and their functions. The structure and functions of the intestinal villi. The structure and functions of the pancreas. The intestinal tubular glands and the function of their secretion. The chief food-stuffs and the chemical elements they contain. Examples of the occurrence of proteid, gelatine, starch, sugar, and fat in articles of food. The form in which nitrogen, hydrogen, and carbon enter and leave the body. The proximate or immediate principles in articles of food. The distinctive chemical characters of albumin, globulin, peptone, tyrosin, starch, glycogen, cane sugar and reducing sugars.

The changes produced in food by mastication and by the action of saliva. The chief changes produced in food by digestion in the stomach and in the small intestine. The action of the pancreatic secretion. The purpose of the digestive changes.

The chief differences between lymph and blood. The nature of chyle. The discrimination between the substances absorbed by the intestinal lymphatics and those absorbed into the intestinal blood.

The structure of the liver, and the course of the blood through it. The arrangements of the ducts of the liver. The composition and functions of the bile.

e. Excretion.

(1) The minute structure of the kidney, ureter, and bladder.

The circulation in the kidney, and the changes which the blood undergoes in passing through it.

The nature of the secretory activity of the kidneys, of its relationship to the glomeruli and tubules, and the circumstances which affect it.

The quantity and nature of the waste products of all kinds excreted by the kidneys in 24 hours. The distinctive chemical characters of urea. The physiological significance of the nitrogenous compounds in urine.

(2) The minute structure of the skin; the functions of the skin and its contained structures; the blood capillaries of the dermis and the conditions which alter their blood capacity.

f. Respiration.

The upper air passages. The structure of the thorax. The pleuræ. The structure of the respiratory organs, and the distribution of the blood through them. The analysis of the respiratory movements in detail. The causation of the diminished intra-thoracic pressure, and the effect on this of inspiration. The mechanism by which coughing, sneezing, sighing, and hiccoughing are effected. The gases of venous and arterial blood. The physical and chemical processes involved in the conversion of inspired into expired air, and of venous into arterial blood. The respiratory activity of the tissues and the conversion of arterial into venous blood.

The manner in which the nervous system regulates the respiratory movements; the respiratory centre. How the nervous mechanism of respiration is affected; (1) by nervous influence, (2) by chemical changes in the blood. The phenomena of dyspnœa, apnœa, and asphyxia.

The influence of the respiratory movements on the circulation.

g. Nutrition; Metabolism; Animal Heat.

The statistics of nutrition; the income and output of the body, how they balance.

The uses of proteid, gelatinous, fatty, and carbohydrate foodstuffs. The effect on metabolism of the following conditions: (1) excess or deficiency of nitrogenous and non-nitrogenous food, (2) muscular exercise.

The energy of the body, its source and expenditure; the amount and character of the daily expenditure.

The sources of the production and the loss of animal heat; their balance during health; how maintained and regulated by changes: (1) in the amount of loss, (2) in the amount of production.

h. The Muscular System and Animal Mechanics.

The structural differences between muscle and tendon, and the functions of these two forms of tissue. The movements of a limb as examples of the results produced by muscular action. The meaning of the terms "origin" and "insertion" as applied to a muscle. The meaning of the terms extensors, flexors, abductors, and abductors as applied to the groups of muscles moving a limb.

The nature of joints, with examples of ball-and-socket, saddle, hinge, and pivot joints. The different kinds of levers, with examples of them in the body.

The minute structure of cartilage, bone, connective tissue, and muscle. Cilia and ciliary action.

The mechanical changes which take place in a muscle during contraction. The characters of a simple and of a tetanic contraction Rigor mortis. Muscle fatigue.

The mechanism of standing and walking.

The structure of the larynx; the movements of the glottis.

i. The Senses.

The different kinds of sensations.

The structure of the papillæ and nerve endings in the skin. The sensations referred to the skin.

The minute structure of the tongue and of taste bulbs.

The structure of the olfactory organ. The nature and extent of the air-chambers connected with it.

The minute structure of the various parts of the eye-ball.

The formation of the image on the retina. The blind spot.

The conditions of distinct vision. Accommodation; its mechanism, limits and defects.

The ophthalmoscope; the retinal blood vessels. Evidence that visual impressions begin in the rods and cones. The peculiar characters of visual sensations, their duration, the influence of fatigue, the fusion of successive sensations, the production of colour perception.

Movements of the eye-ball. Binocular vision. Judgments of distance, form, and solidity.

The structural arrangements of the organ of hearing. The outer-ear. The structure and functions of the middle-ear. The position, structure, and function of the Eustachian tube. The minute structure of the inner-ear. The parts forming the bony and membranous labyrinth.

Auditory sensations. Use of two ears.

j. The Nervous System.

The cerebro-spinal system.

The distinction between motor and sensory nerves.

The relative positions of the following parts: Medulla oblongata, cerebellum, pons, crura cerebri, corpora quadrigemina, cerebral hemispheres, corpus callosum, olfactory bulbs, and optic tracts.

The peripheral distribution, course, and general functions of the twelve pairs of cranial nerves.

The minute structure of the spinal cord; the more important structural differences observable in different parts of the spinal cord.

The chief characters of reflex actions. The connections of the posterior and the anterior roots, and the function of the nerve fibres they contain.

The minute structure of nerves; medullated and non-medullated nerve-fibres. The forms of nerve cells in the spinal cord, posterior root and sympathetic ganglia.

The sympathetic system, its general structure and its anatomical and physiological relations to the cerebro-spinal system.

Higher Examination.

The subject-matter of the examination is arranged in two sections, A. and B., as set forth below, and candidates will be expected to answer questions in both these sections.

Section A.

(1) The subjects set forth in the syllabus of the Lower Examination.

(2) The structure and chief functions of the various parts of the central nervous system.

Section B.

(1) The examination of microscopic specimens displaying the minute structure of organs or tissues.

(2) The description of the simpler methods employed in practical physiological chemistry for the recognition of the compounds present in foods and extracts of body tissues, also those used for demonstrating the changes brought about by the various digestive enzymes.

(3) The description of the methods employed for the examination of blood, hæmoglobin and its derivatives, bile and urine.

In connection with Section B. (1), candidates should be furnished with a microscope, as they will be required to report upon microscopic specimens, and this part of the examination will be compulsory for all candidates; it is therefore necessary that candidates should be familiar with the microscopic appearance of organs and tissues.

It is further very desirable in connection with Section B. (2) and (3), that candidates should have carried out for themselves the simpler chemical operations used in elementary physiological chemistry.

ZOOLOGY.

Lower Examination.

Candidates are expected to show an adequate practical knowledge of the anatomical structure, external characters, mode of life, and life-history (subsequent to hatching) of the animals named, except where particular parts only are expressly indicated.

Compulsory questions may be set at the Examinations.

1. The external features, general anatomical structure, mode of life (feeding, locomotion, self-protection), and life-history of the following animals:—Frog (including the outlines of development), Crayfish, Cockroach, Earthworm, Pond-mussel, Hydra, Vorticella, Amœba. Practical, but not detailed, knowledge of each animal is expected.

2. The skeletons of a frog, a bird, and a mammal (the adaptations of the skeleton to support, locomotion, and prehension of food should receive particular attention).

3. Mammals. The skeleton of the Rabbit in detail. The distinctive features (visible without dissection, but including those drawn from the skeleton and teeth) of the indigenous orders.

4. Birds. The Pigeon, including the skeleton. The development of the Chick as studied by fresh and permanent preparations of entire embryos.

5. Fishes. The Cod or Haddock, including the skeleton.

6. Insects. The Honey-bee and Harlequin-fly (Chironomus) in all their stages (external structure only). The adaptation of these insects to their surroundings, and the adaptation of the Honey-bee to the social state.

7. The characters of the following divisions of the animal kingdom:—Protozoa, Porifera, Cœlentera, Echinodermata, Annelida (Chætopoda included), Arthropoda, Mollusca, Chordata.

8. The characteristic features of the marine, fluviatile and terrestrial faunas. The main facts relating to the geographical distribution of Mammals. Outlines of the geological history of Mammals.

9. Either A. or B.

A. Marine.

The structure and life-history of the Cuttlefish (Sepia or Loligo), Whelk, Shore Crab, Stalked Barnacle, Lug-worm, Starfish, Compound Hydroid (Obelia). The adaptations of these animals to their mode of life.

B. Fluviatile

The structure and life-history of Paludina, Anodon, Daphnia, Leech, Nais, Hydra, Paramecium. Anodon and Hydra are to be studied in more detail than in 1. The adaptations of these animals to their mode of life.

Higher Examination.

Candidates should be furnished with a microscope and dissecting instruments, as they will be required to show their practical knowledge of Zoology by examining and reporting upon specimens, microscopic or otherwise, sent for that purpose, or by carrying out ordinary Zoological dissections.

The examination may include questions on—

1. The structure and life-history of any well-known types of the following groups:—Protozoa, Porifera, Cœlentera, Echinodermata, Vermes, Arthropoda, Mollusca and Vertebrata. The practical work will be confined to:—the common fresh-water Protozoa, Spongilla, a

Calcareous Sponge, Cordylophora, or other common Zoophyte, Aurelia, Nereis, Bugula, Daphnia, Lepas, Cancer, Gammarus, Scolopendra, Periplaneta, Dytiscus, Apis, Pieris, Chironomus, Mya, Chiton, Helix, Buccinum, Sepia, Uraster, Echinus, Ascidia, Amphioxus, Perca, Raia, Columba, Lepus.

2. The elements of Comparative Osteology and Embryology.

3. Modes of reproduction of animals Ovogenesis, Fertilisation.

4. The development of the Tadpole, Chick, Chironomus, and Limnæa. A practical knowledge of these is expected.

5. The classes and orders of the Animal Kingdom.

6. A general knowledge of the theories of Heredity and Evolution.

7. The distribution of Vertebrata. The characters and sub-divisions of the zoological regions. The interpretation of the facts of distribution.

BOTANY.

Specimens, not necessarily selected from the prescribed orders, may be set for practical description.

Compulsory questions may be set at the Examinations.

Lower Examination.

General Morphology, Histology, and Physiology.

I. The differentiation of the plant-body into root, stem, and leaf.

i. The morphology of the root and its modifications; the branching of the root.

ii. The morphology of the stem and its modifications; the modes of branching of the stem; the structure and position of buds; vernation.

iii. The morphology of the leaf; the different kinds of leaves; the branching of the leaf; the different parts of the leaf; leaf-base stipules, petiole, blade; their special modifications; the arrangement of leaves on the stem.

II. The structure of the organs and members, including—

i. The chief characters of the vegetable cell, including an elementary knowledge of its chief constituents and contents.
The protoplasm, nucleus, plastids.
The cell-wall, starch-grains.

ii. The structural characters and distribution of the tissues.
The tegumentary tissues, stomata, lenticels.
The cortical and medullary tissues, medullary rays.
The vascular tissues, distinctions between wood and bast.

III. The functions of the various organs; the relation of their structure to their functions.

i. The chemical nature of the food-elements of plants. Their sources, and the modes in which they are respectively absorbed by the organism.

ii. The absorption of water. Turgescence. Movement of water in the plant. Transpiration, its significance. Methods of demonstrating and of measuring its rate.

iii. Photosynthesis (carbon-assimilation) in green plants. The study of chlorophyll and its spectrum. The chemical nature of the chief organic substances formed within the plant, starch, cellulose, sugars, fats, albuminoids.

iv. Aeration of the tissues by means of intercellular spaces.

v. Respiration. Its significance. Methods of demonstrating its occurrence.

vi. Growth. Determination of the rate of growth in stems and roots. Conditions which affect growth.

vii. Irritability as manifested by growing and motile organs. Geotropism, heliotropism, movements due to mechanical or chemical stimuli, *e.g.*, the stamens of Barberry, the tentacles on the leaf of Sundew.

Special Morphology and Physiology of the Angiospermous Flowering Plant.

The inflorescence and its mode of branching; bracts; the difference between definite and indefinite inflorescences; the distinctive characters of the following kinds: raceme, spike, spadix, corymb, panicle, umbel, head, cyme, glomerule.

The morphology of the flower and its organs as illustrated by wild or commonly cultivated plants; torus (or receptacle), perianth, androecium, gynæcium: æstivation: the symmetry of the flower: the modifications of the flower due to cohesion, adhesion, suppression, and multiplication of the various parts.

The calyx: the sepals; their form, arrangement, and function.

The corolla: the petals; their form, arrangement, and function.

The androecium; the structure and use of the stamen; the filament anther, pollen-sacs, pollen.

The gynæcium; the structure of the carpel; the stigma, style, ovary, placenta.

The structure and form of the ovule; the embryo-sac and its contents.

The processes of pollination and fertilisation.

The morphology of the fruit: the distinctive characters of the different kinds of fruits.

The structure of the seed; presence or absence of albumen (endosperm, perisperm), structure and position of the embryo, nature of the aril. Adaptations for the dispersal of seeds. The various modes of germination.

The different provisions for the persistence of the individual plants: annuals, biennials, perennials.

The distinctive characters of the classes Dicotyledons and Monocotyledons and of their principal divisions and of the following natural orders: credit will be given for knowledge based on acquaintance with the plants as they occur in their natural surroundings:—

Ranunculaceæ.	Scrophulariaceæ.
Cruciferæ.	Labiatæ.
Crassulaceæ.	Salicineæ.
Leguminosæ.	Gramineæ.
Rosaeæ.	Liliaceæ.
Campanulaceæ.	Orchidaceæ.
Compositæ.	Amaryllidaceæ.

The character of the vegetation commonly found growing in such localities as a roadside, hedgerow, wood, meadow, moor, sea coast, &c. (It is not expected that candidates will necessarily have visited all these localities, and a choice will be given in questions relating to them, but no credit will be given for answers which do not show that the candidate

has practical acquaintance with the vegetation of the locality he may select.)

They will also be expected to exhibit a practical acquaintance with :—

I. The morphology of GYMNOSPERMS, as exemplified by Pinus.

II. The morphology of the VASCULAR CRYPTOGAMS, as exemplified by Selaginella and Aspidium.

III. The morphology of the MUSCINEÆ, as exemplified by Funaria and Pellia.

IV. The morphology of the ALGÆ, as exemplified by Fucus, Spirogyra, Hæmatococcus (Sphærella).

V. The morphology and physiology of the FUNGI (including Lichens) as exemplified by :—

Agaricus.
Eurotium.
Puccinia.
Parmelia (Physcia) or Collema.
Pythium or Cystopus (Albugo).
Mucor.
Saccharomyces.

Higher Examination.

In addition to a higher standard of knowledge of the subjects prescribed in the foregoing syllabus for the Lower Examination, candidates will be expected to show a general knowledge of—

(1) the British Flora and the following exotic natural orders of Angiosperms, *viz.*, Palmæ, Scitamineæ, Guttiferæ, Rutaceæ, Myrtaceæ, Piperaceæ.

(2) the principal forms of the Gymnosperms, Vascular, Cryptogams, Muscineæ, Algæ, and Fungi, and the following fossil types (together with their fructifications), Lepidodendron, Lyginodendron, Sphenophyllum, Cheirostrobus, Calamites, Bennettites, Cordaites.

(3) the characteristics and affinities of the great groups of plants.

(4) the general Biology (Bionomics) of plants, including adaptation to environment, origin of species, natural selection: the characteristic features of the various plant societies (Ecology):

(5) Vegetable Physiology of a more advanced character than in the Lower Examination.

GEOLOGY.

Lower Examination.

The Crust of the Globe; its Density and Chemical Composition: Comparison with Meteorites; Distribution of Temperature; Isogeotherms.

The common rock-forming minerals. Their Crystallography and other Physical Characters; their Chemical Composition; the characters by which they may be distinguished in thin sections under the microscope.

Rocks, their classification, structure, chemical composition and mineralogical constitution; megascopic and microscopic characters; the changes they undergo.

Stratification, varieties of; False-bedding; Ripple marks, &c.; Conditions of deposition as indicated by features of strata; Oolitic and nodular structures; Septaria, cone-in-cone, flint and chert; Joints and columnar structure; Folds, Faults and Thrusts and their varieties; Fault-rocks and Breccias; Slickensides, Mylonites, &c.; Cleavage and its origin; Contact and Regional Metamorphism.

Dip and strike of rocks; the effects of sub-aerial, fluviatile and marine denudation in moulding the surface of a country; the construction and use of geological maps and sections; calculation of true from apparent dip, &c.

Fossils, mineralisation by different substances; portions of organisms preserved; casts, tracks, burrows, &c.; derived fossils and pseudo-fossils; the chief living and extinct groups of Plants and Animals.

Leading features and characteristic fossils of the series of British Formations and comparison with their European equivalents.

The features presented by Volcanic and Plutonic rock-masses; Distinction of intrustive and interbedded rocks; Volcanoes and their products; Geysers and mineral springs; Nature and origin of Mineral Veins.

Higher Examination.

Physical features of the Earth's surface and their formation by the action of meteoric agencies, rivers, glaciers and the sea; Changes in the distribution of temperature and pressure in the atmosphere, hydrosphere and lithosphere; Deposits now forming in the ocean, in lakes and in rivers and on the land; glacial formations.

Volcanic phenomena and the materials formed by the action of volcanoes, geysers and mineral springs. Earthquakes and the methods and instruments of seismographical investigation. Proofs of permanent movements and dislocations taking place in the earth's crust.

The evolution of the surface features of a country as the joint result of sub-aerial and subterranean action. Changes taking place in the contours and drainage system in different districts as the result of these actions.

Methods employed in surveying geologically districts of which the topographical features have been more or less definitely determined; the construction of geological sections from data of different degrees of accuracy.

The minor divisions of geological formations; Zones and their modes of distinction; relative values of zone-fossils.

The British formations and their characteristic fossils; comparisons of these with their equivalents in different portions of the globe; reasoning based on the study of the faunas and floras of different formations; synthetic and persistent types.

Petrology and the microscopic study of rocks, with the optical principles on which the determination of rock-forming mineral depends; the origin and metamorphoses of rocks.

MINERALOGY.

Specimens of minerals will be sent for an examination in which the blowpipe and the reagents enumerated below may be used. The specimens sent to be examined will be in the state of coarse powder, and are to be tested as to their physical and chemical properties in accordance with the syllabus, so far as the use of the apparatus and reagents mentioned below will permit.

The powders supplied for blowpipe examination in the higher stage will be of more complex character than in the lower; and the candidate will be required to make a systematic blowpipe analysis, stating his results in tabular form.

For determination by inspection, any minerals (with the exception of very rare ones) may be set at this stage, and also the chief varieties of the more common minerals.

Each candidate for examination in Mineralogy should be provided with a portable set of blowpipe apparatus.

The following articles and reagents must be included in this set:—

Oil or Candle Blowpipe-Lamp.
Mouth Blowpipe.
Small Agate or Porcelain Mortar.
Platinum Wire.
" Foil.
Charcoal.
Open and closed Glass-Tubes.
Silver Foil or Silver Coin.
Magnet.
Knife.
Lens.
Tinfoil.
Cobalt Glass.
Copper Wire.
Magnesium Ribbon or Wire.
Borax.
Sodium Carbonate.
Microcosmic Salt.
Cobalt-Nitrate Solution.
Hydrochloric Acid.
Sulphuric Acid.
Litmus Paper, red and blue.
Potassium Iodide and Sulphur.

The questions set to test the practical knowledge of the candidates will be compulsory.

Lower Examination.

Crystals; their symmetry and classification; axial relations; the use of symbols; projection; irregularities and anomalies in crystals; twinning of crystals and its varieties; cleavage; goniometers and their use.

Specific gravity of minerals and the methods of its determination; pycnometers; the use of heavy liquids. Hardness and its determination; forms assumed by minerals; peculiarities of smell, taste and touch; magnetic and electrical properties of minerals; cleavage and its determination.

Classification of minerals based on their chemical composition; action of acids on minerals; the blowpipe and its use, with the principal reagents; this knowledge will be tested by powdered specimens being sent for examination by the candidate. The comparative fusibility, the effect of heating in closed and open tubes, the colour given to the flame, the encrustation and metallic beads on charcoal, the effects of fusing metallic oxides with borax and with microcosmic salt, should be clearly stated.

Isomorphism; variation in angular measurements; polymorphism (examples of dimorphism and trimorphism); pseudomorphism, its varieties and mode of origin of each kind.

Optical characters of minerals. Lustre; translucency; colour (essential and accidental); refractive index; double refraction; pleochroism (examples of dichroism and trichroism); polariscopes.

A knowledge of the characters exhibited by common minerals (especially of the rock-forming minerals and ores) will be tested by specimens being supplied for determination by inspection.

Higher Examination.

A more complete knowledge of the principles and methods of crystallography and crystal-notation and calculation; different forms of goniometers; possible groups of crystals.

The symmetry of crystals as determined by hardness figures and etched figures, natural and artificial; the sclerometer; parting planes and the means by which they are developed.

Optical characters of minerals. Reflectometers, polariscopes, stauroscopes, dichroiscopes, wedges, and their uses; observations in parallel and convergent light; interference figures; circular polarisation, right- and left-handed; formation of Airy's spirals.

Isomorphism; polymorphism; isodimorphism; as illustrated in different groups of minerals; pleochroism exhibited in face and axis

colours; pyroelectricity and its relation to hemimorphism; the chemical changes which minerals undergo; pseudomorphism.

Lamellar and multiple twinning. Effects of heat on minerals; optical anomalies, and the explanations proposed to account for them.

A knowledge of all the minerals described in ordinary manuals is required, with an acquaintance with the chief varieties of the most important of them.

Special familiarity is required with minerals of economic value and with their uses. Ores, gems and the minerals employed as sources of aluminium, magnesium, sodium, tungsten, tantalum, uranium, thorium, radium, &c. Minerals used as abrasives, pigments, &c.

FREEHAND DRAWING.

Each candidate will be expected to draw in outline on a half imperial sheet of paper A and either B or C:—

A. A group of simple objects placed before him as seen from the point of view at which he may be seated.

B. Simple scientific apparatus from memory *or sketches illustrating some subject of the subsequent competitive examination*;

or

C. A pictorial sketch of some simple and common machine or engine detail, working drawings of which will be supplied.

No instruments may be brought into the examination room except pen, pencil, and india-rubber. All ruling, measuring, and other mechanical aids are forbidden at the examination.

USEFUL CONSTANTS AND MATHEMATICAL TABLES.*

If any Examination Paper contains questions for the solution of which Useful Constants and Mathematical Tables are necessary, a copy of the Tables will be supplied to each candidate taking that paper.

USEFUL CONSTANTS.

(Many of the more fundamental data given here should become, by repeated use, part of the mental equipment of technical students. They are given in this place for convenience of reference.)

1 Inch = 25·40 millimetres. 1 mm. = ·03937 inch.

1 Gallon = ·1604 cubic foot = 10 lb. of water at 62° F.

1 Knot = 6080 feet per hour = 1 Nautical mile per hour.

Weight of 1 lb. in London = 445,000 dynes.

One pound avoirdupois = 7000 grains = 453·6 grammes.

1 Cubic foot of water weighs 62·3 lb.

1 Cubic foot of air at 0° C. and 1 atmosphere, weighs ·0807 lb.

1 Cubic foot of Hydrogen at 0° C. and 1 atmosphere, weighs ·00559 lb.

1 Foot-pound = $1·3562 \times 10^7$ ergs.

1 Horse-power-hour = 33000 × 60 foot-pounds.

1 Electrical unit = 1000 watt-hours = 1·34 horse-power-hours.

Joule's Equivalent to suit Regnault's H, is { 774 ft.-lb. = 1 Fah. unit. / 1393 ft.-lb. = 1 Cent. ,,

1 Horse-power = 33000 foot-pounds per minute = 746 watts.

Volts × ampères = watts.

1 Atmosphere = 14·7 lb. per square inch = 2116 lb. per square foot = 760 mm. of mercury = 10^6 dynes per sq. cm. nearly.

A column of water 2·3 feet high corresponds to a pressure of 1 lb. per sq. inch.

Absolute temp., $t = \theta°$ C. + 273° or $\theta°$ F. + 459·4°.

Regnault's H = 606·5 + ·305 $\theta°$ C. = 1082 + ·305 $\theta°$ F.

[N.B.—Every student who studies the properties of steam should habitually use a Steam Table. Regnault's expression gives only approximately correct results, and students should be definitely told that it is not accurate, though by its means the quantities can be calculated with sufficient precision for most engineering problems.]

$p\,u^{1·0646} = 479.$

$$\log_{10} p = 6·1007 - \frac{B}{t} - \frac{C}{t^2},$$

where $\log_{10} B = 3·1812$, $\log_{10} C. = 5·0882$.

p is in pounds per sq. inch, t is absolute temperature Centigrade.

u is the volume in cubic feet per pound of steam.

$\pi = 3·1416.$

One radian = 57·30 degrees.

To convert common into Napierian logarithms, multiply by 2·3026.

The base of the Napierian logarithms is $e = 2·7183.$

The value of g at London = 32·182 feet per sec. per sec.

* These "Useful Constants and Mathematical Tables" are also published separately, and may be purchased, either directly or through any Bookseller, from Wyman and Sons, Ltd., Fetter Lane, E.C., and 54, St. Mary Street, Cardiff; or H.M. Stationery Office (Scottish Branch), 23, Forth Street, Edinburgh; or E. Pousonby, Ltd., 116, Grafton Street, Dublin. Price 1*d.*, or 5*s.* per 100.

Logarithms.

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10	0000	0043	0086	0128	0170	0212	0253	0294	0334	0374	4	9	13	17	21	26	30	34	38
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11	0414	0453	0492	0531	0569	0607	0645	0682	0719	0755	4	8	12	15	19	23	27	31	35
											4	7	11	15	19	22	26	30	33
12	0792	0828	0864	0899	0934	0969	1004	1038	1072	1106	3	7	11	14	18	21	25	28	32
											3	7	10	14	17	20	24	27	31
13	1139	1173	1206	1239	1271	1303	1335	1367	1399	1430	3	7	10	13	16	20	23	26	30
											3	7	10	12	16	19	22	25	29
14	1461	1492	1523	1553	1584	1614	1644	1673	1703	1732	3	6	9	12	15	18	21	24	28
											3	6	9	12	15	17	20	23	26
15	1761	1790	1818	1847	1875	1903	1931	1959	1987	2014	3	6	9	11	14	17	20	23	26
											3	5	8	11	14	16	19	22	25
16	2041	2068	2095	2122	2148	2175	2201	2227	2253	2279	3	5	8	11	14	16	19	22	24
											3	5	8	10	13	15	18	21	23
17	2304	2330	2355	2380	2405	2430	2455	2480	2504	2529	3	5	8	10	13	15	18	20	23
											2	5	7	10	12	15	17	19	22
18	2553	2577	2601	2625	2648	2672	2695	2718	2742	2765	2	5	7	9	12	14	16	19	21
											2	5	7	9	11	14	16	18	21
19	2788	2810	2833	2856	2878	2900	2923	2945	2967	2989	2	4	7	9	11	13	16	18	20
											2	4	6	8	11	13	15	17	19
20	3010	3032	3054	3075	3096	3118	3139	3160	3181	3201	2	4	6	8	11	13	15	17	19
21	3222	3243	3263	3284	3304	3324	3345	3365	3385	3404	2	4	6	8	10	12	14	16	18
22	3424	3444	3464	3483	3502	3522	3541	3560	3579	3598	2	4	6	8	10	12	14	15	17
23	3617	3636	3655	3674	3692	3711	3729	3747	3766	3784	2	4	6	7	9	11	13	15	17
24	3802	3820	3838	3856	3874	3892	3909	3927	3945	3962	2	4	5	7	9	11	12	14	16
25	3979	3997	4014	4031	4048	4065	4082	4099	4116	4133	2	3	5	7	9	10	12	14	15
26	4150	4166	4183	4200	4216	4232	4249	4265	4281	4298	2	3	5	7	8	10	11	13	15
27	4314	4330	4346	4362	4378	4393	4409	4425	4440	4456	2	3	5	6	8	9	11	13	14
28	4472	4487	4502	4518	4533	4548	4564	4579	4594	4609	2	3	5	6	8	9	11	12	14
29	4624	4639	4654	4669	4683	4698	4713	4728	4742	4757	1	3	4	6	7	9	10	12	13
30	4771	4786	4800	4814	4829	4843	4857	4871	4886	4900	1	3	4	6	7	9	10	11	13
31	4914	4928	4942	4955	4969	4983	4997	5011	5024	5038	1	3	4	6	7	8	10	11	12
32	5051	5065	5079	5092	5105	5119	5132	5145	5159	5172	1	3	4	5	7	8	9	11	12
33	5185	5198	5211	5224	5237	5250	5263	5276	5289	5302	1	3	4	5	6	8	9	10	12
34	5315	5328	5340	5353	5366	5378	5391	5403	5416	5428	1	3	4	5	6	8	9	10	11
35	5441	5453	5465	5478	5490	5502	5514	5527	5539	5551	1	2	4	5	6	7	9	10	11
36	5563	5575	5587	5599	5611	5623	5635	5647	5658	5670	1	2	4	5	6	7	8	10	11
37	5682	5694	5705	5717	5729	5740	5752	5763	5775	5786	1	2	3	5	6	7	8	9	10
38	5798	5809	5821	5832	5843	5855	5866	5877	5888	5899	1	2	3	5	6	7	8	9	10
39	5911	5922	5933	5944	5955	5966	5977	5988	5999	6010	1	2	3	4	5	7	8	9	10
40	6021	6031	6042	6053	6064	6075	6085	6096	6107	6117	1	2	3	4	5	6	8	9	10
41	6128	6138	6149	6160	6170	6180	6191	6201	6212	6222	1	2	3	4	5	6	7	8	9
42	6232	6243	6253	6263	6274	6284	6294	6304	6314	6325	1	2	3	4	5	6	7	8	9
43	6335	6345	6355	6365	6375	6385	6395	6405	6415	6425	1	2	3	4	5	6	7	8	9
44	6435	6444	6454	6464	6474	6484	6493	6503	6513	6522	1	2	3	4	5	6	7	8	9
45	6532	6542	6551	6561	6571	6580	6590	6599	6609	6618	1	2	3	4	5	6	7	8	9
46	6628	6637	6646	6656	6665	6675	6684	6693	6702	6712	1	2	3	4	5	6	7	7	8
47	6721	6730	6739	6749	6758	6767	6776	6785	6794	6803	1	2	3	4	5	5	6	7	8
48	6812	6821	6830	6839	6848	6857	6866	6875	6884	6893	1	2	3	4	4	5	6	7	8
49	6902	6911	6920	6928	6937	6946	6955	6964	6972	6981	1	2	3	4	4	5	6	7	8
50	6990	6998	7007	7016	7024	7033	7042	7050	7059	7067	1	2	3	3	4	5	6	7	8

Logarithms.

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51	7076	7084	7093	7101	7110	7118	7126	7135	7143	7152	1	2	3	3	4	5	6	7	8
52	7160	7168	7177	7185	7193	7202	7210	7218	7226	7235	1	2	2	3	4	5	6	7	7
53	7243	7251	7259	7267	7275	7284	7292	7300	7308	7316	1	2	2	3	4	5	6	6	7
54	7324	7332	7340	7348	7356	7364	7372	7380	7388	7396	1	2	2	3	4	5	6	6	7
55	7404	7412	7419	7427	7435	7443	7451	7459	7466	7474	1	2	2	3	4	5	5	6	7
56	7482	7490	7497	7505	7513	7520	7528	7536	7543	7551	1	2	2	3	4	5	5	6	7
57	7559	7566	7574	7582	7589	7597	7604	7612	7619	7627	1	2	2	3	4	5	5	6	7
58	7634	7642	7649	7657	7664	7672	7679	7686	7694	7701	1	1	2	3	4	4	5	6	7
59	7709	7716	7723	7731	7738	7745	7752	7760	7767	7774	1	1	2	3	4	4	5	6	7
60	7782	7789	7796	7803	7810	7818	7825	7832	7839	7846	1	1	2	3	4	4	5	6	6
61	7853	7860	7868	7875	7882	7889	7896	7903	7910	7917	1	1	2	3	4	4	5	6	6
62	7924	7931	7938	7945	7952	7959	7966	7973	7980	7987	1	1	2	3	3	4	5	6	6
63	7993	8000	8007	8014	8021	8028	8035	8041	8048	8055	1	1	2	3	3	4	5	5	6
64	8062	8069	8075	8082	8089	8096	8102	8109	8116	8122	1	1	2	3	3	4	5	5	6
65	8129	8136	8142	8149	8156	8162	8169	8176	8182	8189	1	1	2	3	3	4	5	5	6
66	8195	8202	8209	8215	8222	8228	8235	8241	8248	8254	1	1	2	3	3	4	5	5	6
67	8261	8267	8274	8280	8287	8293	8299	8306	8312	8319	1	1	2	3	3	4	5	5	6
68	8325	8331	8338	8344	8351	8357	8363	8370	8376	8382	1	1	2	3	3	4	4	5	6
69	8388	8395	8401	8407	8414	8420	8426	8432	8439	8445	1	1	2	2	3	4	4	5	6
70	8451	8457	8463	8470	8476	8482	8488	8494	8500	8506	1	1	2	2	3	4	4	5	6
71	8513	8519	8525	8531	8537	8543	8549	8555	8561	8567	1	1	2	2	3	4	4	5	5
72	8573	8579	8585	8591	8597	8603	8609	8615	8621	8627	1	1	2	2	3	4	4	5	5
73	8633	8639	8645	8651	8657	8663	8669	8675	8681	8686	1	1	2	2	3	4	4	5	5
74	8692	8698	8704	8710	8716	8722	8727	8733	8739	8745	1	1	2	2	3	4	4	5	5
75	8751	8756	8762	8768	8774	8779	8785	8791	8797	8802	1	1	2	2	3	3	4	5	5
76	8808	8814	8820	8825	8831	8837	8842	8848	8854	8859	1	1	2	2	3	3	4	5	5
77	8865	8871	8876	8882	8887	8893	8899	8904	8910	8915	1	1	2	2	3	3	4	4	5
78	8921	8927	8932	8938	.8943	8949	8954	8960	8965	8971	1	1	2	2	3	3	4	4	5
79	8976	8982	8987	8993	8998	9004	9009	9015	9020	9025	1	1	2	2	3	3	4	4	5
80	9031	9036	9042	9047	9053	9058	9063	9069	9074	9079	1	1	2	2	3	3	4	4	5
81	9085	9090	9096	9101	9106	9112	9117	9122	9128	9133	1	1	2	2	3	3	4	4	5
82	9138	9143	9149	9154	9159	9165	9170	9175	9180	9186	1	1	2	2	3	3	4	4	5
83	9191	9196	9201	9206	9212	9217	9222	9227	9232	9238	1	1	2	2	3	3	4	4	5
84	9243	9248	9253	9258	9263	9269	9274	9279	9284	9289	1	1	2	2	3	3	4	4	5
85	9294	9299	9304	9309	9315	9320	9325	9330	9335	9340	1	1	2	2	3	3	4	4	5
86	9345	9350	9355	9360	9365	9370	9375	9380	9385	9390	1	1	2	2	3	3	4	4	5
87	9395	9400	9405	9410	9415	9420	9425	9430	9435	9440	0	1	1	2	2	3	3	4	4
88	9445	9450	9455	9460	9465	9469	9474	9479	9484	9489	0	1	1	2	2	3	3	4	4
89	9494	9499	9504	9509	9513	9518	9523	9528	9533	9538	0	1	1	2	2	3	3	4	4
90	9542	9547	9552	9557	9562	9566	9571	9576	9581	9586	0	1	1	2	2	3	3	4	4
91	9590	9595	9600	9605	9609	9614	9619	9624	9628	9633	0	1	1	2	2	3	3	4	4
92	9638	9643	9647	9652	9657	9661	9666	9671	9675	9680	0	1	1	2	2	3	3	4	4
93	9685	9689	9694	9699	9703	9708	9713	9717	9722	9727	0	1	1	2	2	3	3	4	4
94	9731	9736	9741	9745	9750	9754	9759	9763	9768	9773	0	1	1	2	2	3	3	4	4
95	9777	9782	9786	9791	9795	9800	9805	9809	9814	9818	0	1	1	2	2	3	3	4	4
96	9823	9827	9832	9836	9841	9845	9850	9854	9859	9863	0	1	1	2	2	3	3	4	4
97	9868	9872	9877	9881	9886	9890	9894	9899	9903	9908	0	1	1	2	2	3	3	4	4
98	9912	9917	9921	9926	9930	9934	9939	9943	9948	9952	0	1	1	2	2	3	3	4	4
99	9956	9961	9965	9969	9974	9978	9983	9987	9991	9996	0	1	1	2	2	3	3	3	4

Antilogarithms.

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·01	1023	1026	1028	1030	1033	1035	1038	1040	1042	1045	0	0	1	1	1	1	2	2	2
·02	1047	1050	1052	1054	1057	1059	1062	1064	1067	1069	0	0	1	1	1	1	2	2	2
·03	1072	1074	1076	1079	1081	1084	1086	1089	1091	1094	0	0	1	1	1	1	2	2	2
·04	1096	1099	1102	1104	1107	1109	1112	1114	1117	1119	0	1	1	1	1	2	2	2	2
·05	1122	1125	1127	1130	1132	1135	1138	1140	1143	1146	0	1	1	1	1	2	2	2	2
·06	1148	1151	1153	1156	1159	1161	1164	1167	1169	1172	0	1	1	1	1	2	2	2	2
·07	1175	1178	1180	1183	1186	1189	1191	1194	1197	1199	0	1	1	1	1	2	2	2	2
·08	1202	1205	1208	1211	1213	1216	1219	1222	1225	1227	0	1	1	1	1	2	2	2	3
·09	1230	1233	1236	1239	1242	1245	1247	1250	1253	1256	0	1	1	1	1	2	2	2	3
·10	1259	1262	1265	1268	1271	1274	1276	1279	1282	1285	0	1	1	1	1	2	2	2	3
·11	1288	1291	1294	1297	1300	1303	1306	1309	1312	1315	0	1	1	1	2	2	2	2	3
·12	1318	1321	1324	1327	1330	1334	1337	1340	1343	1346	0	1	1	1	2	2	2	2	3
·13	1349	1352	1355	1358	1361	1365	1368	1371	1374	1377	0	1	1	1	2	2	2	3	3
·14	1380	1384	1387	1390	1393	1396	1400	1403	1406	1409	0	1	1	1	2	2	2	3	3
·15	1413	1416	1419	1422	1426	1429	1432	1435	1439	1442	0	1	1	1	2	2	2	3	3
·16	1445	1449	1452	1455	1459	1462	1466	1469	1472	1476	0	1	1	1	2	2	2	3	3
·17	1479	1483	1486	1489	1493	1496	1500	1503	1507	1510	0	1	1	1	2	2	2	3	3
·18	1514	1517	1521	1524	1528	1531	1535	1538	1542	1545	0	1	1	1	2	2	2	3	3
·19	1549	1552	1556	1560	1563	1567	1570	1574	1578	1581	0	1	1	1	2	2	3	3	3
·20	1585	1589	1592	1596	1600	1603	1607	1611	1614	1618	0	1	1	1	2	2	3	3	3
·21	1622	1626	1629	1633	1637	1641	1644	1648	1652	1656	0	1	1	2	2	2	3	3	3
·22	1660	1663	1667	1671	1675	1679	1683	1687	1690	1694	0	1	1	2	2	2	3	3	3
·23	1698	1702	1706	1710	1714	1718	1722	1726	1730	1734	0	1	1	2	2	2	3	3	4
·24	1738	1742	1746	1750	1754	1758	1762	1766	1770	1774	0	1	1	2	2	2	3	3	4
·25	1778	1782	1786	1791	1795	1799	1803	1807	1811	1816	0	1	1	2	2	2	3	3	4
·26	1820	1824	1828	1832	1837	1841	1845	1849	1854	1858	0	1	1	2	2	3	3	3	4
·27	1862	1866	1871	1875	1879	1884	1888	1892	1897	1901	0	1	1	2	2	3	3	3	4
·28	1905	1910	1914	1919	1923	1928	1932	1936	1941	1945	0	1	1	2	2	3	3	4	4
·29	1950	1954	1959	1963	1968	1972	1977	1982	1986	1991	0	1	1	2	2	3	3	4	4
·30	1995	2000	2004	2009	2014	2018	2023	2028	2032	2037	0	1	1	2	2	3	3	4	4
·31	2042	2046	2051	2056	2061	2065	2070	2075	2080	2084	0	1	1	2	2	3	3	4	4
·32	2089	2094	2099	2104	2109	2113	2118	2123	2128	2133	0	1	1	2	2	3	3	4	4
·33	2138	2143	2148	2153	2158	2163	2168	2173	2178	2183	0	1	1	2	2	3	3	4	4
·34	2188	2193	2198	2203	2208	2213	2218	2223	2228	2234	1	1	2	2	3	3	4	4	5
·35	2239	2244	2249	2254	2259	2265	2270	2275	2280	2286	1	1	2	2	3	3	4	4	5
·36	2291	2296	2301	2307	2312	2317	2323	2328	2333	2339	1	1	2	2	3	3	4	4	5
·37	2344	2350	2355	2360	2366	2371	2377	2382	2388	2393	1	1	2	2	3	3	4	4	5
·38	2399	2404	2410	2415	2421	2427	2432	2438	2443	2449	1	1	2	2	3	3	4	4	5
·39	2455	2460	2466	2472	2477	2483	2489	2495	2500	2506	1	1	2	2	3	3	4	5	5
·40	2512	2518	2523	2529	2535	2541	2547	2553	2559	2564	1	1	2	2	3	4	4	5	5
·41	2570	2576	2582	2588	2594	2600	2606	2612	2618	2624	1	1	2	2	3	4	4	5	5
·42	2630	2636	2642	2649	2655	2661	2667	2673	2679	2685	1	1	2	2	3	4	4	5	6
·43	2692	2698	2704	2710	2716	2723	2729	2735	2742	2748	1	1	2	3	3	4	4	5	6
·44	2754	2761	2767	2773	2780	2786	2793	2799	2805	2812	1	1	2	3	3	4	4	5	6
·45	2818	2825	2831	2838	2844	2851	2858	2864	2871	2877	1	1	2	3	3	4	5	5	6
·46	2884	2891	2897	2904	2911	2917	2924	2931	2938	2944	1	1	2	3	3	4	5	5	6
·47	2951	2958	2965	2972	2979	2985	2992	2999	3006	3013	1	1	2	3	3	4	5	5	6
·48	3020	3027	3034	3041	3048	3055	3062	3069	3076	3083	1	1	2	3	4	4	5	6	6
·49	3090	3097	3105	3112	3119	3126	3133	3141	3148	3155	1	1	2	3	4	4	5	6	6

Antilogarithms.

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·50	3162	3170	3177	3184	3192	3199	3206	3214	3221	3228	1	1	2	3	4	4	5	6	7
·51	3236	3243	3251	3258	3266	3273	3281	3289	3296	3304	1	2	2	3	4	5	5	6	7
·52	3311	3319	3327	3334	3342	3350	3357	3365	3373	3381	1	2	2	3	4	5	5	6	7
·53	3388	3396	3404	3412	3420	3428	3436	3443	3451	3459	1	2	2	3	4	5	6	6	7
·54	3467	3475	3483	3491	3499	3508	3516	3524	3532	3540	1	2	2	3	4	5	6	6	7
·55	3548	3556	3565	3573	3581	3589	3597	3606	3614	3622	1	2	2	3	4	5	6	7	7
·56	3631	3639	3648	3656	3664	3673	3681	3690	3698	3707	1	2	3	3	4	5	6	7	8
·57	3715	3724	3733	3741	3750	3758	3767	3776	3784	3793	1	2	3	3	4	5	6	7	8
·58	3802	3811	3819	3828	3837	3846	3855	3864	3873	3882	1	2	3	4	4	5	6	7	8
·59	3890	3899	3908	3917	3926	3936	3945	3954	3963	3972	1	2	3	4	5	5	6	7	8
·60	3981	3990	3999	4009	4018	4027	4036	4046	4055	4064	1	2	3	4	5	6	6	7	8
·61	4074	4083	4093	4102	4111	4121	4130	4140	4150	4159	1	2	3	4	5	6	7	8	9
·62	4169	4178	4188	4198	4207	4217	4227	4236	4246	4256	1	2	3	4	5	6	7	8	9
·63	4266	4276	4285	4295	4305	4315	4325	4335	4345	4355	1	2	3	4	5	6	7	8	9
·64	4365	4375	4385	4395	4406	4416	4426	4436	4446	4457	1	2	3	4	5	6	7	8	9
·65	4467	4477	4487	4498	4508	4519	4529	4539	4550	4560	1	2	3	4	5	6	7	8	9
·66	4571	4581	4592	4603	4613	4624	4634	4645	4656	4667	1	2	3	4	5	6	7	9	10
·67	4677	4688	4699	4710	4721	4732	4742	4753	4764	4775	1	2	3	4	5	7	8	9	10
·68	4786	4797	4808	4819	4831	4842	4853	4864	4875	4887	1	2	3	4	6	7	8	9	10
·69	4898	4909	4920	4932	4943	4955	4966	4977	4989	5000	1	2	3	5	6	7	8	9	10
·70	5012	5023	5035	5047	5058	5070	5082	5093	5105	5117	1	2	4	5	6	7	8	9	11
·71	5129	5140	5152	5164	5176	5188	5200	5212	5224	5236	1	2	4	5	6	7	8	10	11
·72	5248	5260	5272	5284	5297	5309	5321	5333	5346	5358	1	2	4	5	6	7	9	10	11
·73	5370	5383	5395	5408	5420	5433	5445	5458	5470	5483	1	3	4	5	6	8	9	10	11
·74	5495	5508	5521	5534	5546	5559	5572	5585	5598	5610	1	3	4	5	6	8	9	10	12
·75	5623	5636	5649	5662	5675	5689	5702	5715	5728	5741	1	3	4	5	7	8	9	10	12
·76	5754	5768	5781	5794	5808	5821	5834	5848	5861	5875	1	3	4	5	7	8	9	11	12
·77	5888	5902	5916	5929	5943	5957	5970	5984	5998	6012	1	3	4	5	7	8	10	11	12
·78	6026	6039	6053	6067	6081	6095	6109	6124	6138	6152	1	3	4	6	7	8	10	11	13
·79	6166	6180	6194	6209	6223	6237	6252	6266	6281	6295	1	3	4	6	7	9	10	11	13
·80	6310	6324	6339	6353	6368	6383	6397	6412	6427	6442	1	3	4	6	7	9	10	12	13
·81	6457	6471	6486	6501	6516	6531	6546	6561	6577	6592	2	3	5	6	8	9	11	12	14
·82	6607	6622	6637	6653	6668	6683	6699	6714	6730	6745	2	3	5	6	8	9	11	12	14
·83	6761	6776	6792	6808	6823	6839	6855	6871	6887	6902	2	3	5	6	8	9	11	13	14
·84	6918	6934	6950	6966	6982	6998	7015	7031	7047	7063	2	3	5	6	8	10	11	13	15
·85	7079	7096	7112	7129	7145	7161	7178	7194	7211	7228	2	3	5	7	8	10	12	13	15
·86	7244	7261	7278	7295	7311	7328	7345	7362	7379	7396	2	3	5	7	8	10	12	13	15
·87	7413	7430	7447	7464	7482	7499	7516	7534	7551	7568	2	3	5	7	9	10	12	14	16
·88	7586	7603	7621	7638	7656	7674	7691	7709	7727	7745	2	4	5	7	9	11	12	14	16
·89	7762	7780	7798	7816	7834	7852	7870	7889	7907	7925	2	4	5	7	9	11	13	14	16
·90	7943	7962	7980	7998	8017	8035	8054	8072	8091	8110	2	4	6	7	9	11	13	15	17
·91	8128	8147	8166	8185	8204	8222	8241	8260	8279	8299	2	4	6	8	9	11	13	15	17
·92	8318	8337	8356	8375	8395	8414	8433	8453	8472	8492	2	4	6	8	10	12	14	15	17
·93	8511	8531	8551	8570	8590	8610	8630	8650	8670	8690	2	4	6	8	10	12	14	16	18
·94	8710	8730	8750	8770	8790	8810	8831	8851	8872	8892	2	4	6	8	10	12	14	16	18
·95	8913	8933	8954	8974	8995	9016	9036	9057	9078	9099	2	4	6	8	10	12	15	17	19
·96	9120	9141	9162	9183	9204	9226	9247	9268	9290	9311	2	4	6	8	11	13	15	17	19
·97	9333	9354	9376	9397	9419	9441	9462	9484	9506	9528	2	4	7	9	11	13	15	17	20
·98	9550	9572	9594	9616	9638	9661	9683	9705	9727	9750	2	4	7	9	11	13	16	18	20
·99	9772	9795	9817	9840	9863	9886	9908	9931	9954	9977	2	5	7	9	11	14	16	18	20

Angle. Degrees.	Angle. Radians.	Chord.	Sine.	Tangent.	Co-tangent.	Cosine.			
0°	0	0	0	0	∞	1	1·414	1·5708	90°
1	·0175	·017	·0175	·0175	57·2900	·9998	1·402	1·5533	89
2	·0349	·035	·0349	·0349	28·6363	·9994	1·389	1·5359	88
3	·0524	·052	·0523	·0524	19·0811	·9986	1·377	1·5184	87
4	·0698	·070	·0698	·0699	14·3007	·9976	1·364	1·5010	86
5	·0873	·087	·0872	·0875	11·4301	·9962	1·351	1·4835	85
6	·1047	·105	·1045	·1051	9·5144	·9945	1·338	1·4661	84
7	·1222	·122	·1219	·1228	8·1443	·9925	1·325	1·4486	83
8	·1396	·140	·1392	·1405	7·1154	·9903	1·312	1·4312	82
9	·1571	·157	·1564	·1584	6·3138	·9877	1·299	1·4137	81
10	·1745	·174	·1736	·1763	5·6713	·9848	1·286	1·3963	80
11	·1920	·192	·1908	·1944	5·1446	·9816	1·272	1·3788	79
12	·2094	·209	·2079	·2126	4·7046	·9781	1·259	1·3614	78
13	·2269	·226	·2250	·2309	4·3315	·9744	1·245	1·3439	77
14	·2443	·244	·2419	·2493	4·0108	·9703	1·231	1·3265	76
15	·2618	·261	·2588	·2679	3·7321	·9659	1·218	1·3090	75
16	·2793	·278	·2756	·2867	3·4874	·9613	1·204	1·2915	74
17	·2967	·296	·2924	·3057	3·2709	·9563	1·190	1·2741	73
18	·3142	·313	·3090	·3249	3·0777	·9511	1·176	1·2566	72
19	·3316	·330	·3256	·3443	2·9042	·9455	1·161	1·2392	71
20	·3491	·347	·3420	·3640	2·7475	·9397	1·147	1·2217	70
21	·3665	·364	·3584	·3839	2·6051	·9336	1·133	1·2043	69
22	·3840	·382	·3746	·4040	2·4751	·9272	1·118	1·1868	68
23	·4014	·399	·3907	·4245	2·3559	·9205	1·104	1·1694	67
24	·4189	·416	·4067	·4452	2·2460	·9135	1·089	1·1519	66
25	·4363	·433	·4226	·4663	2·1445	·9063	1·075	1·1345	65
26	·4538	·450	·4384	·4877	2·0503	·8988	1·060	1·1170	64
27	·4712	·467	·4540	·5095	1·9626	·8910	1·045	1·0996	63
28	·4887	·484	·4695	·5317	1·8807	·8829	1·030	1·0821	62
29	·5061	·501	·4848	·5543	1·8040	·8746	1·015	1·0647	61
30	·5236	·518	·5000	·5774	1·7321	·8660	1·000	1·0472	60
31	·5411	·534	·5150	·6009	1·6643	·8572	·985	1·0297	59
32	·5585	·551	·5299	·6249	1·6003	·8480	·970	1·0123	58
33	·5760	·568	·5446	·6494	1·5399	·8387	·954	·9948	57
34	·5934	·585	·5592	·6745	1·4826	·8290	·939	·9774	56
35	·6109	·601	·5736	·7002	1·4281	·8192	·923	·9599	55
36	·6283	·618	·5878	·7265	1·3764	·8090	·908	·9425	54
37	·6458	·635	·6018	·7536	1·3270	·7986	·892	·9250	53
38	·6632	·651	·6157	·7813	1·2799	·7880	·877	·9076	52
39	·6807	·668	·6293	·8098	1·2349	·7771	·861	·8901	51
40	·6981	·684	·6428	·8391	1·1918	·7660	·845	·8727	50
41	·7156	·700	·6561	·8693	1·1504	·7547	·829	·8552	49
42	·7330	·717	·6691	·9004	1·1106	·7431	·813	·8378	48
43	·7505	·733	·6820	·9325	1·0724	·7314	·797	·8203	47
44	·7679	·749	·6947	·9657	1·0355	·7193	·781	·8029	46
45°	·7854	·765	·7071	1·0000	1·0000	·7071	·765	·7854	45°
			Cosine	Co-tangent	Tangent	Sine	Chord	Radians	Degrees
								Angle	

TIME TABLES OF EXAMINATIONS IN SCIENCE AND TECHNOLOGY, 1914.

(a) Qualifying Examinations held only for Candidates for Royal Scholarships and Free Studentships, &c.

N.B.—These examinations are held under the provisions of the Regulations for Scholarships, &c., in Science, 1914. Those competitors who are required to attend the Qualifying Examinations are duly notified to that effect by the Board of Education. Candidates taking Freehand Drawing in the competition for Sir Joseph Whitworth's Scholarships and Exhibitions will take the examination on Monday, March 2nd, as the Competitive Examination in that subject.

1914.

2nd Mar., Monday	7 to 9.30 p.m.	FREEHAND DRAWING. Pen, pencil, and india-rubber will be required.
3rd ,, Tuesday	7 to 10 p.m.	MAGNETISM AND ELECTRICITY.
4th ,, Wednesday	7 to 10 p.m.	MECHANICS (SOLIDS). Compasses, a scale of equal parts, and a protractor will be required.
5th ,, Thursday	7 to 10 p.m.	MECHANICS (FLUIDS). Compasses, a scale of equal parts, and a protractor will be required.
6th ,, Friday	7 to 10 p.m.	SOUND, LIGHT, AND HEAT.
7th ,, Saturday	6 to 8 p.m.; 8 to 10 p.m.	ENGLISH. Two papers will be set and both must be taken.
9th ,, Monday	7 to 10 p.m.	CHEMISTRY.
10th ,, Tuesday	7 to 10 p.m.	MATHEMATICS. Compasses, and a straight edge, will be required by candidates taking the paper for competitors in Groups D (Biology) and E (Geology). Compasses, and a straight edge with a scale of equal parts and a protractor, will be required by candidates taking the paper for competitors in Groups A (Mechanics), B (Physics), and C (Chemistry).

(b) General Examinations.

N.B.—Intending candidates should read the notes on page 83.

1914.

13th May, Wednesday	7 to 10 p.m.	THEORETICAL MECHANICS (FLUIDS). Compasses, a scale of equal parts, and a protractor will be required.
14th ,, Thursday	7 to 10 p.m.	THEORETICAL MECHANICS (SOLIDS). Compasses, a scale of equal parts, and a protractor will be required.
15th ,, Friday	7 to 10 p.m.	PURE MATHEMATICS, HIGHER.—Paper I. Compasses, a straight edge with a scale of equal parts, and a protractor will be required. Mathematical Tables will be provided with the examination papers.

(b) GENERAL EXAMINATIONS—*continued.*

1914.

16th May, Saturday	6 to 10 p.m.	PRACTICAL GEOMETRY AND GRAPHICS. Sets of scales (*see* Syllabus of subject) and a protractor will be required. Slide rules may be used. Mathematical Tables will be provided with the examination papers.
	7 to 10 p.m.	COAL MINING.
18th „ Monday	7 to 10 p.m.	PURE MATHEMATICS, LOWER AND HIGHER.—Paper II. Compasses, a straight edge with a scale of equal parts, and a protractor will be required. Mathematical Tables will be provided with the examination papers.
19th „ Tuesday	7 to 10 p.m.	MAGNETISM AND ELECTRICITY.
20th „ Wednesday	7 to 10 p.m.	HEAT.
21st „ Thursday	7 to 10 p.m.	ORGANIC CHEMISTRY. METALLURGY.
22nd „ Friday	7 to 10 p.m.	INORGANIC CHEMISTRY.
23rd „ Saturday	6 to 10 p.m.	BUILDING CONSTRUCTION. Drawing instruments (*see* Syllabus of subject) and scales, and protractors will be required. Slide rules may be used. Mathematical tables will be provided with the Higher Examination papers. NAVAL ARCHITECTURE. Scales, set squares, and ship curves will be required (*see* Syllabus of subject). Slide rules may be used. Mathematical tables will be provided with the examination papers. MACHINE CONSTRUCTION AND DRAWING. Indian ink and scales (see Syllabus of subject) will be required. Slide rules may be used. Tracing paper will be supplied for candidates in the Lower Examination. Mathematical Tables will be provided with the Higher Examination papers.
25th „ Monday	7 to 10 p.m.	PRACTICAL MATHEMATICS. Slide rules may be used. Mathematical Tables will be provided with the examination papers.
26th „ Tuesday	7 to 10 p.m.	APPLIED MECHANICS (MATERIALS AND STRUCTURES). Slide rules may be used. Mathematical Tables will be provided with the examination papers.
27th „ Wednesday	7 to 10 p.m.	APPLIED MECHANICS (MACHINES AND HYDRAULICS). Slide rules may be used. Mathematical Tables will be provided with the examination papers.
28th „ Thursday	7 to 10 p.m.	HEAT ENGINES. Slide rules may be used. Mathematical Tables will be provided with the examination papers. A temperature-entropy diagram will be issued to each candidate.

(b) General Examinations—*continued.*

Note 1.—The conditions under which candidates are eligible for admission to the General Examinations, and the local arrangements under which the Examinations will be held, will be found in Sections 5–9 and 12–21 of the Regulations in this Volume. Intending candidates are recommended to acquaint themselves with the conditions as to age, fees, requirements as to previous study, the date by which, and the manner in which, application must be made, &c.

Note 2.—In each subject of the General Examinations there will be a Higher Examination and a Lower Examination. Two papers will be set in the Higher Examination in Pure Mathematics, and no candidate who does not reach the necessary standard in both papers will be adjudged to have passed the Examination.

(c) Competitive Examinations for Scholarships, Studentships, &c. in Science.

N.B.—Intending Competitors should read the Notes at the end of this Time Table (*see* page 85).

1914.

2nd Mar., Monday	7 to 9.30 p.m.	Freehand Drawing.	
9th May, Saturday	2 to 10 p.m.	Practical Metallurgy.—Higher Examination, 2 to 10 p.m.; Lower Examination, 5 to 10 p.m. The use of note-books, text-books, or works of reference is permitted.	
11th „ Monday	7 to 10 p.m.	Sound and Light. Mineralogy. This examination will include practical blow-pipe analysis. Apparatus, &c. will be required. (*See* Syllabus of subject.)	
12th „ Tuesday	2.30 to 10.30 p.m.	Practical Inorganic Chemistry.—Higher Examination, 2.30 to 10.30 p.m.; Lower Examination, 5.15 to 10.30 p.m.; (Written, 5.15 to 6.15; Practical, 6.30 to 10.30). The use of note-books, text-books, or works of reference is permitted throughout the Higher Examination and during the practical part of the Lower Examination.	
13th „ Wednesday	7 to 10 p.m.	Theoretical Mechanics (Fluids). Compasses, a scale of equal parts, and a protractor will be required. Zoology. A microscope and dissecting instruments may be required by candidates in the Higher Examination.	
14th „ Thursday	7 to 10 p.m.	Theoretical Mechanics (Solids). Compasses, a scale of equal parts, and a protractor will be required. General Biology.	

(c) COMPETITIVE EXAMINATIONS FOR SCHOLARSHIPS, STUDENTSHIPS, &c. IN SCIENCE—*continued.*

1914.

15th May, Friday	7 to 10 p.m.	PURE MATHEMATICS HIGHER—Paper I. Compasses, a straight edge with a scale of equal parts, and a protractor will be required. Mathematical tables will be provided with the examination papers.	
		BOTANY.	
16th „ Saturday	6 to 10 p.m.	PRACTICAL GEOMETRY AND GRAPHICS. Sets of scales (*see* Syllabus of subject) and a protractor will be required. Slide rules may be used. Mathematical tables will be provided with the examination papers.	
18th „ Monday	7 to 10 p.m.	PURE MATHEMATICS, LOWER AND HIGHER—Paper II. Compasses, a straight edge with a scale of equal parts, and a protractor will be required. Mathematical tables will be provided with the examination papers.	
19th „ Tuesday	7 to 10 p.m.	MAGNETISM AND ELECTRICITY	
20th „ Wednesday	7 to 10 p.m.	HEAT.	
21st „ Thursday	7 to 10 p.m.	ORGANIC CHEMISTRY.	
		METALLURGY.	
22nd „ Friday	7 to 10 p.m.	INORGANIC CHEMISTRY.	
23rd „ Saturday	2.30 to 10.30 p.m.	PRACTICAL ORGANIC CHEMISTRY.—Higher Examination, 2.30 to 10.30 p.m.; Lower Examination, 6 to 10.30 p.m.; (Written, 6 to 7; Practical, 7.15 to 10.30). The use of note-books, text-books, or works of reference is permitted throughout the Higher Examination and during the practical part of the Lower Examination.	
	6 to 10 p.m.	BUILDING CONSTRUCTION. Drawing instruments (*see* Syllabus of subject) and scales and protractors will be required. Slide rules may be used. Mathematical tables will be provided with the Higher Examination papers.	
		NAVAL ARCHITECTURE. Scales, set squares, and ship curves will be required (*see* Syllabus of subject). Slide rules may be used. Mathematical tables will be provided with the examination papers.	
		MACHINE CONSTRUCTION AND DRAWING. Indian ink and scales (*see* Syllabus of subject) will be required. Slide rules may be used. Tracing paper will be supplied for candidates in the Lower Examination. Mathematical tables will be provided with the Higher Examination papers.	

(c) COMPETITIVE EXAMINATIONS FOR SCHOLARSHIPS, STUDENTSHIPS, &c. IN SCIENCE—*continued.*

1914.

25th May,	Monday	7 to 10 p.m.	PRACTICAL MATHEMATICS. Slide rules may be used. Mathematical tables will be provided with the examination papers.
26th „	Tuesday	7 to 10 p.m.	APPLIED MECHANICS (MATERIALS AND STRUCTURES). Slide rules may be used. Mathematical tables will be provided with the examination papers. HUMAN PHYSIOLOGY. A microscope will be required by candidates in the Higher Examination.
27th „	Wednesday	7 to 10 p.m.	APPLIED MECHANICS (MACHINES AND HYDRAULICS). Slide rules may be used. Mathematical tables will be provided with the examination papers.
28th „	Thursday	7 to 10 p.m.	HEAT ENGINES. Slide rules may be used. Mathematical tables will be provided with the examination papers. A temperature-entropy diagram will be issued to each candidate. GEOLOGY.

Note 1.—These examinations are only held for—

(i) accepted candidates for Scholarships, Exhibitions, and Studentships, particulars of which are contained in the Board's Regulations for Scholarships, &c. in Science, 1914, and in the Prospectus of Sir Joseph Whitworth's Scholarships and Exhibitions (42nd edition), copies of which can be obtained on application to the Secretary, Board of Education, Whitehall, London, S.W.;

(ii) such Local Science Exhibitions, &c. as with the approval of the Board are awarded in connection with these examinations.

Note.—The examination in Freehand Drawing is only a Competitive Examination for candidates competing this year for the Whitworth Scholarships and Exhibitions.

Note 2.—In each subject, except General Biology and Freehand Drawing, in which only one examination is held, there will be a Higher and a Lower Examination. Two papers will be set in the Higher Examination in Pure Mathematics; and Candidates sitting for this Examination are expected to take both papers.

Note 3.—Candidates for Royal Scholarships, Free Studentships, and Whitworth Scholarships and Exhibitions must make application for admission to the Competition on the prescribed form (copies of which can be obtained from the Board) **not later than 1st January 1914.**

For Official Use.

BOARD OF EDUCATION.

REGULATIONS FOR SCHOLARSHIPS, EXHIBITIONS, &c., IN SCIENCE, FOR THE YEAR 1914.

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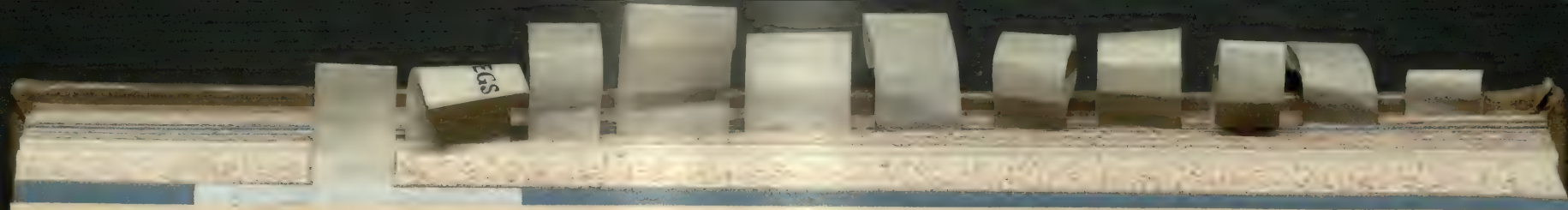

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PREFATORY MEMORANDUM.

The awards for Science to be made by the Board under these Regulations are in the main identical with those made by the Board under the Regulations for Scholarships, Exhibitions, &c., in Science, 1913.

No changes of substance have been made in the Regulations for 1914.

L. A. Selby-Bigge

August 1913.

CONTENTS.

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CHAPTER I.

Royal Scholarships and Free Studentships (Science), 1914.

Conditions of Competition and Tenure.

General Conditions.

1.—(*a*) Royal Scholarships and Free Studentships are open only to British Subjects, and the Board may refuse to award them to persons whose financial circumstances do not warrant such aid. Royal Scholarships and Free Studentships may not be held concurrently with Special Studentships or Local Science Exhibitions; but, subject to the sanction of the Board of Education, these awards may be held concurrently with other Scholarships or aid granted by local authorities.

(*b*) No person who has held a Studentship in Training or a Special Studentship for Teachers of Science or Technology, or who has been for more than one session a student of the Imperial College of Science and Technology, London, or of the Royal College of Science, Dublin, is eligible to compete for a Royal Scholarship or Free Studentship.

(*c*) No person who has held a Royal Scholarship or Free Studentship (or, under former regulations, a Royal Exhibition or National Scholarship in Science), is eligible to enter into further competition for these awards.

(*d*) No person who has been trained as a recognised Student in a Training College for the Training of Elementary or Secondary School Teachers under the Regulations of the Board of Education, the Scotch Education Department, or the Commissioners of National Education for Ireland, will be eligible to compete for a Royal Scholarship or Free Studentship.

2. Not less than twenty Royal Scholarships and eleven Free Studentships will be offered for competition in 1914.

3. Intending candidates must make their applications for admission to the competition on the prescribed form (copies of which can be obtained from the Board) not later than **1st January 1914**. The application must indicate the subjects and stages in which the candidate desires to be examined for the purposes of the competition, and must be accompanied by a certificate of British nationality

upon a separate form prescribed for the purpose. Credit will not be given for marks obtained in examinations other than those entered on the form of application.

Qualifying Test for Admission to the Competitive Examination.

4.—(*a*) No person will be permitted to compete for a Royal Scholarship or Free Studentship unless he can satisfy the Board that he has received a good general education. For this purpose a candidate must submit to the Board evidence of his educational qualifications in the following subjects:—.

English.
Mathematics.
Mechanics (Solids and Fluids).
Chemistry.
Sound, Light and Heat.
Magnetism and Electricity.
Freehand Drawing.

(*b*) Particulars of the qualifications on which a candidate relies as evidence of having received such an education must be submitted upon the application form.

(*c*) A Matriculation Examination Certificate of a British University will be accepted as evidence of the candidate's proficiency in English, and in such of the other subjects specified above as were successfully offered for that Examination.

(*d*) The requirements in Mathematics and in the Science subjects will be satisfied by a first class in Stage 1 (of the Board's old examinations), except that for candidates in Groups A, B, and C (*see* Articles 9 and 10) a success in Mathematics (Pure or Practical) in Stage 2 (of the old examinations) or in the Board's Lower Examination will be required.

(*e*) A pass at the Board's Examinations in an Art subject involving proficiency in Freehand Drawing will be accepted as evidence of qualification in Freehand Drawing.

(*f*) The Board are also prepared to consider such alternative evidence of proficiency in any of these subjects as candidates may wish to advance.

5. Candidates whose educational qualifications are approved as satisfactory will receive from the Board a notification to that effect and will be registered as candidates in the Competitive Examination.

6.—(*a*) Candidates who fail to satisfy the Board of their general educational qualifications will be notified of the

subjects in which they will be required by the Board to take qualifying examinations. The subjects of these examinations will be those specified in Article 4 (*a*) above.

(*b*) In Mathematics the papers set for candidates in Groups A, B, and C will be different from those set for candidates in Groups D and E.

(*c*) The standard of the qualifying examinations will correspond to that required in 1913.

(*d*) These examinations, for which no fee will be charged by the Board, will be held from 2nd to 10th March. The Time Table is printed on page 17. Further arrangements will be announced later.

(*e*) Candidates will be informed of their success or failure at the qualifying examinations in time to enable them, in the event of their failure, to retire from the Competitive Examination.

(*f*) Those candidates who satisfy the Board of their educational qualifications under Article 4 above, or under this Article, will alone be eligible to compete for Royal Scholarships and Free Studentships.

Conditions of the Competitive Examination.

7. Royal Scholarships and Free Studentships tenable for periods beginning with the Session 1914–15 will, so far as there are candidates of satisfactory merit, be awarded on the results of the Science Examinations of the Board held in 1914, and in the case of certain subjects, of Special Examinations held for the purpose of the award of these Scholarships and Studentships. Previous successes will not be counted.

8. Candidates must make their own arrangements for admission to the Competitive Examinations to be held from the 9th to the 28th May The Time Table of these Examinations is printed on page 17.

9.—(*a*) The subjects for competition for the Royal Scholarships and Free Studentships are divided into groups; for the year 1914 sixteen Scholarships and eight Free Studentships are allotted for competition in the five groups detailed below, four Scholarships and two Free Studentships in each of the Groups A, B, and C, and two Scholarships and one Free Studentship in each of the Groups D and E. The other Scholarships and

Free Studentships may be awarded in such groups as the Board may decide.

(*b*) Should the standard of the attainments of the candidates in a group be unsatisfactory, the Board may withhold any of the awards in that group, or may transfer them to another group.

10. The subjects included in the various groups are :—

GROUP A.—*Mechanics.*

Pure Mathematics.
Practical Mathematics.
Theoretical Mechanics (Solids).
Theoretical Mechanics (Fluids).
Applied Mechanics (Materials and Structures).
„ „ (Machines and Hydraulics).
Heat Engines.
Machine Construction and Drawing,
or
Building Construction,
or
Naval Architecture.

GROUP B.—*Physics.*

Pure Mathematics.
Practical Mathematics.
Sound and Light.*
Heat.
Magnetism and Electricity.
Inorganic Chemistry, Theoretical.
„ Practical.*

GROUP C.—*Chemistry.*

Pure Mathematics.
Practical Mathematics.
Heat,
or
Magnetism and Electricity.
Inorganic Chemistry, Theoretical.
„ „ Practical.*
Organic Chemistry, Theoretical.
„ „ Practical,*
or
Metallurgy, Theoretical.
„ Practical.*

GROUP D.—*Biology.*

General Biology.*
Human Physiology.*
Zoology.*
Botany.*

GROUP E.—*Geology.*

Geology.*
Mineralogy.*
Zoology.*
Botany.*

11.—(*a*) The Examinations in the subjects marked * will be held for the purposes of this competition only.

(*b*) In all the subjects except General Biology two examinations will be held, viz., a "Lower" and a "Higher" Examination, and, with the exception of the subjects marked *, these will be identical with the Lower and Higher Examinations of the Board's Scheme of General Science Examinations. A Lower Examination only will be held in General Biology.

(*c*) The Lower Examination in each subject will consist of one paper, except that in the Lower Examinations in Practical Organic and Practical Inorganic Chemistry a short written paper will be set in addition to the practical tests. The Higher Examination will consist of one paper in all cases except Pure Mathematics, in which two papers will be set.

(*d*) Candidates who take the Higher Examination will be required, in all subjects except Pure Mathematics, Practical Mathematics, Theoretical Mechanics (Solids and Fluids), Machine Construction and Drawing, Building Construction, and Naval Architecture, to submit their laboratory note-books signed and certified by their teachers, for inspection.

(*e*) No fee will be charged by the Board to candidates for any examination taken for the purpose of the competition. The amount of local charges which may be made by the Local Education Authority or Managers is given in the Board's Regulations for the Local Management and conduct of Examinations. No announcement will be made of the result of any examination, unless it is identical with a "Lower" or "Higher" examination in the Board's Scheme of General Science Examinations, and unless the candidate has satisfied all the conditions of

admission to that examination, including the payment of the fee.

12. A candidate may not compete in more than one group, and must state beforehand the group in which he elects to compete. He may take all the subjects in the group selected, except in the case of alternative subjects, only one of which may be taken.

13. No candidate will be permitted to take both the Higher and the Lower Examination in the same subject.

14. The maximum number of marks obtainable in each subject of the examination is:—

Lower Examination - - -	200
Higher „ (except Pure Mathematics) - - -	350

Half the above number of marks will be obtainable in the case of the Practical Examinations.

250 marks will be obtainable on each of the two papers constituting the Higher Examination in Pure Mathematics.

15.—(*a*) In awarding Royal Scholarships and Free Studentships the Board will take into consideration the degree of success obtained by candidates in each of the subjects taken by them as well as the results of the Examination as a whole.

(*b*) Before considering what awards should be made the marks in each subject will be diminished in the Lower Examination by 40 per cent., and in the Higher Examination by 30 per cent. of the maximum allotted in each case.

Conditions of Tenure.

16. Each Scholarship or Studentship is held on the condition that the holder attends regularly the approved course of instruction (*see* Articles 17 and 18 below), complies with all the rules of the Institution at which the Scholarship or Studentship is held, and passes the prescribed examinations.

17. A Royal Scholarship entitles the holder to free admission to the lectures and laboratory work at the Imperial College of Science and Technology, or at the Royal College of Science, Dublin, and to a maintenance allowance of 60*l*. a session. The scholarship is tenable during the period necessary to complete the course which is approved by the Board for each scholar at either Institution.

18. A Free Studentship entitles the holder to free admission to the lectures and laboratory work at the Imperial College of Science and Technology, and is tenable during the period necessary to complete the course which is approved by the Board for each student at that Institution.

19. The holder of a Royal Scholarship will be allowed railway fare (third class) between his home and London or Dublin, as the case may be, for one journey to and fro each session. The holder of a Free Studentship will be allowed railway fare (third class) for one journey to London upon taking up his Free Studentship.

Note.—The syllabuses of the subjects of competition may be obtained from Messrs. Wyman and Sons, Ltd., Fetter Lane, London, E.C.; or H.M. Stationery Office (Scottish Branch), 23, Forth Street, Edinburgh; or Messrs. E. Ponsonby, Ltd., 116, Grafton Street, Dublin.

Whitworth Scholarships and Exhibitions, 1914.

Conditions of Competition and Tenure.

20. Four Whitworth Scholarships of 125*l.* a year, tenable for three years, and thirty 50*l.* Exhibitions tenable for one year, are awarded in competition at the Examinations held by the Board for the award of Royal Scholarships and Free Studentships with the addition of Examinations in Practical Geometry and Graphics, and Freehand Drawing. The conditions of the competition and of the awards are stated in the "Prospectus of Sir Joseph Whitworth's Scholarships and Exhibitions for Mechanical Science," which is published separately. Applications for admission to the Competition must be made not later than **1st January 1914.**

NOTICE TO CANDIDATES IN SCOTLAND AND IRELAND.

As the local arrangements for the Board's Examinations in Science in Scotland and Ireland are made by the Scotch Education Department and the Department of Agriculture and Technical Instruction respectively, applications by Candidates in Scotland and Ireland for information as to centres of Examination, &c., should be

addressed to "The Secretary, Scotch Education Department, Whitehall, London, S.W.," or to "The Secretary, Department of Agriculture and Technical Instruction, 4, Upper Merrion Street, Dublin," as the case may be.

CHAPTER II.

Local Exhibitions in Science.

21. Where a Local Education Authority or other persons (in this chapter referred to as the managers of the local fund) contribute a sum of not less than 25*l.* per annum towards an approved Local Science Exhibition, the Board may contribute towards the Exhibition subject to the conditions stated in this chapter.

22.—(*a*) The Board's contribution will not exceed 25*l.* per annum in respect of any one exhibitioner, nor will it be such as to make the total amount of the Exhibition exceed the sum recognised by the Board as reasonably paid by the managers of the local fund in respect of the exhibitioner's maintenance allowance and fees or other payments for his instruction.

(*b*) If the Exhibition is held at the Imperial College of Science and Technology the Board's contribution will be made in respect of maintenance allowance only. (*See* Article 27 (*c*)).

23. The local contribution may be made from a rate levied under Part II. of the Education Act, 1902, or from subscriptions of living persons raised for this definite purpose. Endowments or moneys held in trust, unless subscribed for this definite purpose by the donor during his lifetime, or funds derived from the residue under the Local Taxation (Customs and Excise) Act, 1890, or other mere surplus funds, will not be regarded as local contributions for the purpose of this chapter.

24. The conditions of award of the Exhibition may be determined by the managers of the local fund with the approval of the Board, but must always include provision for the award to be made on the results of a competition held either in connection with the Board's Examinations for Royal Scholarships, etc., or according to some other method approved by the Board. If the former alternative is adopted, the competition must be held in accordance with the provisions of Articles 7–15 above.

25. If the competition is to be held in connection with the Board's Royal Scholarship Examinations, a list of candidates and of the centres at which they propose to be examined, together with full particulars of the groups, subjects, and stages selected must be sent to the Board not later than **1st March 1914.**

26.—(*a*) No award will, as a rule, be approved by the Board unless the candidate has reached a standard comparable with that required for the award of a Royal Scholarship.

(*b*) The Board may refuse to contribute towards any Exhibition for which there is not a sufficient number of competitors, or to approve the award to a candidate who is insufficiently advanced.

(*c*) The Board may refuse to approve the award of a Local Exhibition to a candidate whose financial circumstances do not appear to warrant such aid.

(*d*) The Exhibition may not be held concurrently with any of the Board's Scholarships, Exhibitions, or Studentships, nor may it be held by a person who is, or has been, recognised as a student under the Regulations for the Training of Teachers for Elementary Schools.

27. The place or places where the Exhibition is to be tenable, and where the exhibitioner is to pursue his studies, may be fixed by the managers of the local fund, subject to the following conditions:—

(*a*) The exhibitioner must attend some course of Science instruction of University standard at a University, University College, or other institution approved by the Board at which such a course is provided for the students ordinarily in attendance at the institution as well as for exhibitioners under this chapter. The course proposed to be taken by the exhibitioner must be approved by the Board, and it must as a rule be one of the courses so provided.

(*b*) The exhibitioner must have the option of holding his Exhibition at the Imperial College of Science and Technology, subject to compliance with the regulations of that institution. These regulations require the Exhibitioner to satisfy the authorities of the College by examination or otherwise that he has received a good general education, including, as essential elements,

English, the elements of Chemistry and Physics, Mathematics, Mechanics, and Freehand Drawing, with—in the case of engineering students—Mechanical Drawing, so as to render it possible for him to follow the College course with advantage.

(*c*) The Board have made arrangements by which exhibitioners exercising the option referred to in (*b*) will be admitted without any charge for their instruction.

(*d*) If the exhibitioner attends a college or other institution aided or maintained by the managers of the local fund, the Board may require that the fees or ordinary payments in respect of the instruction shall be wholly or partially remitted.

(*e*) The exhibitioner's whole time must be devoted to instruction in the approved course.

(*f*) The Board may require a report on the progress of the exhibitioner to be made by one of their officers deputed for this purpose.

(*g*) A Local Science Exhibition is tenable for three years, except in cases where the course of study approved is of a sufficiently advanced character to justify a shorter tenure. Any Exhibition may be discontinued after any year if the Exhibitioner's progress is not satisfactory.

28. The Board's contribution will not be payable till the managers of the local fund have disbursed to or on behalf of the exhibitioner the full amount of the Exhibition including the amount of the Board's grant. Before paying their contribution the Board will require (i) a certificate from the Principal of the institution at which the Exhibition is held of the satisfactory conduct and progress of the exhibitioner, (ii) evidence from the institution of the receipt by them of the exhibitioner's fees or other payments for instruction, and (iii) a receipt from the exhibitioner for the amount of his maintenance allowance.

29.—(*a*) Particulars of any Exhibition to which it is desired that the Board should contribute under this chapter must be returned on the prescribed form in time to admit of their proper consideration by the Board, and their due advertisement in the locality, and in any case not later than the

1st January 1914. The names of the successful candidates, and of the institutions where they will pursue their studies, must be furnished to the Board on the prescribed form before **1st September 1914.**

(*b*) Applications by candidates for admission to competitions for Local Science Exhibitions must be made to the Local Education Authority, or other Managers of the local fund.

30. Applications for the renewal of Exhibitions for a second or third year must be made on the prescribed form not later than the **1st September.**

CHAPTER III.

Other Awards.

Special Studentships for Teachers of Science or Technology.

31. The Board are prepared to nominate a limited number of Teachers of Classes in Science or Technology for attendance at courses of advanced instruction at the Imperial College of Science and Technology—as a rule those of the third or fourth year. Particulars of these courses will be issued early in 1914.

32. Persons selected are nominated, in the first instance, for a term or for a session, but, in exceptional cases, if the Board are satisfied that their professional efficiency will benefit adequately by further instruction in the College, the tenure of the award may be extended for further periods, so, however, that it shall not continue for more than two years in all.

33. Teachers holding these awards will be entitled to free admission to the lectures and laboratory work of the approved course at the Imperial College of Science and Technology, to maintenance allowances at the rate of 60*l.* a year for the duration of the courses to which they are nominated, and to third-class railway fare for one journey each session to and fro between their homes and London.

34.—(*a*) Candidates for these awards should have sufficient knowledge of Science to enable them to enter at

once upon the courses to which they are nominated, and will be required to furnish on the prescribed application form particulars of their education and training and of their teaching experience.

(*b*) No person who has been trained as a recognised student in a Training College for the training of Elementary or Secondary School Teachers under the Regulations of the Board of Education, the Scotch Education Department, or the Commissioners of National Education for Ireland, will be eligible for the award of a Special Studentship for Teachers of Science or Technology.

(*c*) These awards may not be held concurrently with a Local Science Exhibition, or with any of the Board's Scholarships &c.; but, subject to the sanction of the Board, they may be held concurrently with other Scholarships or aid granted by Local Authorities.

Short Courses of Instruction in Science for Teachers.

35. Short courses of instruction in Science are given at the Imperial College of Science and Technology during July or August for a limited number of Teachers whose preliminary training enables them to profit by instruction in courses related to their work.

36. A selected candidate will receive third-class railway fare for one journey from his home to London at the beginning and for one journey from London to his home at the end of the course, also a grant at the rate of 1*l.* a week up to a maximum of 3*l.* towards his expenses while attending the course. In the case of teachers resident in London or its vicinity a reduction is made in the grant.

Information as to the precise period of these courses and forms of application for admission are circulated about April.

Assisted Studentships at Universities and University Colleges.

37. Aid is granted to a limited number of teachers engaged in science teaching who are selected to attend for instruction at certain Universities and University Colleges, but the Board do not, as a rule, make payments in aid of fees for attending Evening Classes at those Institutions. Particulars of the courses of instruction and of the nature

and conditions of the Board's assistance will be sent on application.

Allowances paid to Science Teachers who are sent abroad, or who travel in the Service of the Board.

38. Science Teachers who are sent abroad, or who travel in the service of the Board, receive 10*s.* a night while required to be absent from home, second-class railway fares, and cab or omnibus fares.

Travelling Expenses of Students attending the Imperial College of Science and Technology with the Aid of the Board.

39. When any student who is attending the Imperial College of Science and Technology with the aid of the Board is directed to attend elsewhere for instruction or practice, he may be allowed the cost of travelling within certain limits.

L. A. SELBY-BIGGE.

Time Table of Examinations for Royal Scholarships and Free Studentships, 1914.

Qualifying Examinations.

Date.	Day of the Week.	Time.	Subject.
2nd March	Monday	7–9.30 p.m.	Freehand Drawing.
3rd ,,	Tuesday	7–10 p.m.	Magnetism and Electricity.
4th ,,	Wednesday	7–10 p.m.	Mechanics (Solids).
5th ,,	Thursday	7–10 p.m.	Mechanics (Fluids).
6th ,,	Friday	7–10 p.m.	Sound, Light and Heat.
7th ,,	Saturday	6–10 p.m.	English.
9th ,,	Monday	7–10 p.m.	Chemistry.
10th ,,	Tuesday	7–10 p.m.	Mathematics.

Competitive Examinations.

9th May	Saturday	2–10 p.m.	Practical Metallurgy (Higher Examination).
		5–10 p.m.	Practical Metallurgy (Lower Examination).
11th ,,	Monday	7–10 p.m.	Sound and Light. Mineralogy.
12th ,,	Tuesday	2.30–10.30 p.m.	Practical Inorganic Chemistry (Higher Examination).
		5.15–10.30 p.m.	Practical Inorganic Chemistry (Lower Examination).
13th ,,	Wednesday	7–10 p.m.	Theoretical Mechanics (Fluids). Zoology.
14th ,,	Thursday	7–10 p.m.	Theoretical Mechanics (Solids). General Biology.
15th ,,	Friday	7–10 p.m.	Pure Mathematics, Higher.—Paper I. Botany.
18th ,,	Monday	7–10 p.m.	Pure Mathematics, Lower, and Higher.—Paper II.
19th ,,	Tuesday	7–10 p.m.	Magnetism and Electricity.
20th ,,	Wednesday	7–10 p.m.	Heat.
21st ,,	Thursday	7–10 p.m.	Theoretical Organic Chemistry. Theoretical Metallurgy.
22nd ,,	Friday	7–10 p.m.	Theoretical Inorganic Chemistry.
23rd ,,	Saturday	2.30–10.30 p.m.	Practical Organic Chemistry (Higher Examination).
		6–10.30 p.m.	Practical Organic Chemistry (Lower Examination).
		6–10 p.m.	Building Construction. Naval Architecture. Machine Construction and Drawing.
25th ,,	Monday	7–10 p.m.	Practical Mathematics.
26th ,,	Tuesday	7–10 p.m.	Applied Mechanics (Materials and Structures). Human Physiology.
27th ,,	Wednesday	7–10 p.m.	Applied Mechanics (Machines and Hydraulics).
28th ,,	Thursday	7–10 p.m.	Heat Engines. Geology.

For Official Use.

BOARD OF EDUCATION, WHITEHALL, LONDON, S.W.

TELEGRAPHIC ADDRESS, "RENSEIGNE, PARL., LONDON."

PROSPECTUS

OF

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FORTY-SECOND EDITION.

Regulations for the Competition in 1914.

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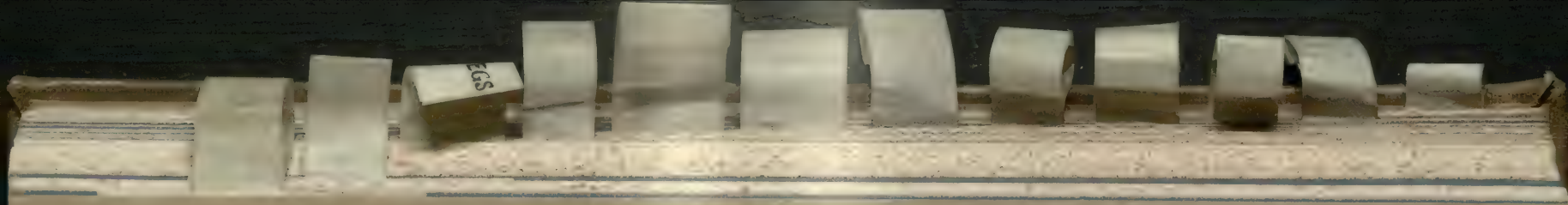
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Rules under which the Scholarships and Exhibitions founded by Sir Joseph Whitworth, Bart., F.R.S., D.C.L., &c., &c., will be awarded in 1914.

1. The Whitworth Scholarships are of the value of £125 a year, and tenable for three years; the Exhibitions are of the value of £50 each, and tenable for one year only. Both the Scholarships and Exhibitions are open for competition to all His Majesty's subjects—whether of the United Kingdom, India, or the Colonies and Dependencies. The rules of the competition are the same for both Scholarships and Exhibitions.

2.—(*a*) The candidate must be of sound bodily constitution.

(*b*) He must not have completed the 26th year of his age on the 1st May of the year in which he competes.

(*c*) He must have been engaged in handicraft in the workshop of a mechanical engineer during ordinary working hours for at least three years. Six consecutive months in each of those years must have been devoted to the forge, or the bench, or the vice, or the lathe, or have been divided in any manner between the vice and the lathe.* In all, not less than three months must have been spent at the vice, and not less than three months at the lathe, and the sum of the periods devoted to the vice and to the lathe must be at least 12 months. The whole of the qualifying work must have been completed before the 1st May of the year in which he competes.

3. Four Scholarships and Thirty Exhibitions will be competed for in 1914. The following are the subjects of competition:—

Practical Geometry and Graphics (Practical Plane and Solid Geometry).
Machine Construction and Drawing.
Building Construction.
Naval Architecture.
Pure Mathematics.
Practical Mathematics.
Theoretical Mechanics (Solids).
Theoretical Mechanics (Fluids).
Applied Mechanics (Materials and Structures).
Applied Mechanics (Machines and Hydraulics).
Sound and Light.†
Heat.
Magnetism and Electricity.
Inorganic Chemistry, Theoretical.
Inorganic Chemistry, Practical.†
Metallurgy, Theoretical.
Metallurgy, Practical.†
Heat Engines.
Freehand Drawing.

4.—(*a*) In all the subjects, except Freehand Drawing, two examinations will be held, viz., a "Lower" and a "Higher" examination, and, with the exception of the subjects marked †, these will be identical with the Lower and Higher Examinations of the Board's scheme of general Science Examinations.

* The Board may accept for this purpose time spent at the Milling Machine—in part at least—in lieu of time spent at the lathe: this does not apply to the conditions of the sentence following.

(*b*) The Lower Examination in each subject will consist of one paper, except that in the Lower Examination in Practical Inorganic Chemistry a short written paper will be set in addition to the practical tests. The Higher Examination will consist of one paper in all cases except Pure Mathematics, in which two papers will be set.

(*c*) No candidate will be permitted to take both the Higher and the Lower Examination in the same subject.

(*d*) The examination in Freehand Drawing will be the Freehand Drawing examination in the Board's Qualifying Examination for Royal Scholarships and Free Studentships, and will be held as part of the Competition on the 2nd March.

(*e*) Candidates who take the Higher Examination will be required, in all subjects except Practical Geometry and Graphics, Pure Mathematics, Practical Mathematics, Theoretical Mechanics (Solids and Fluids), Machine Construction and Drawing, Building Construction, and Naval Architecture, to submit their laboratory note-books, signed and certified by their teachers, for inspection.

(*f*) No fee will be charged by the Board to candidates for any examination taken for the purpose of the competition. The amount of local charges which may be made by the Local Education Authority or Managers is given in the Board's Regulations for the Local Management and conduct of Examinations. No announcement (other than a statement that a candidate has or has not succeeded in qualifying in the subjects mentioned in Article 6) will be made of the result of any examination unless it is identical with a "Lower" or "Higher" examination in the Board's Scheme of General Science Examinations, and unless the candidate has satisfied all the conditions of admission to that examination, including the payment of the fee.

5.—(*a*) Candidates who are, or intend to be, engaged in machine-making—cotton, woollen, flax, &c., or in engineering—marine, locomotive and fixed—or in artillery, may take up all the subjects set out in Article 3 except Building Construction and Naval Architecture; those engaged in the building trades and coach-making, all except Machine Construction and Drawing, and Naval Architecture; those engaged in Naval Architecture, all except Machine Construction and Drawing, and Building Construction. The requirements of Article 2 (*c*) as to practical workshop experience apply equally to all candidates.

(*b*) The number of Scholarships and Exhibitions awarded in each of the foregoing classes will be proportioned to the number and ability of the candidates from each class.

6. No candidate unless qualified under previous regulations (*see* Article 7) can obtain a Scholarship or Exhibition who has not passed in—

(*a*) The Lower or Higher Examination in Practical Geometry and Graphics (Practical Plane and Solid Geometry).

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(*b*) The Lower or Higher Examination in Pure Mathematics or Practical Mathematics.

(*c*) The Lower or Higher Examination in Theoretical Mechanics (Solids) or Theoretical Mechanics (Fluids).

(*d*) Freehand Drawing.

A candidate who is not already qualified in these subjects must take them at the competitive examinations, except that in the case of (*c*) he may qualify by passing the examination in Theoretical Mechanics (Solids) or Theoretical Mechanics (Fluids) at the qualifying examination for Royal Scholarships and Free Studentships. A candidate who is unsuccessful in qualifying in Mechanics at the qualifying examination referred to, is not thereby debarred from obtaining a qualification in this subject in the competition itself. Particulars of the qualifying examinations for Royal Scholarships, &c., will be found in the Board's Regulations for Scholarships, Exhibitions, &c., in Science, 1914.

7. If a candidate has qualified under previous Regulations in the subjects specified in Article 6, it will not be necessary for him to qualify again in those subjects, but no marks can be counted for a success obtained previous to the competition.

8. No candidate can obtain a Scholarship or Exhibition who has not attained sufficient handicraft power. If it be thought necessary by the Board, this may be tested by requiring the candidate to make two Whitworth screw bolts, 1 inch in diameter, and 4 to 6 inches long, with hexagonal heads and nuts alike within ·001 inch.

9. The maximum number of marks obtainable in each subject of the examination is:—

Lower Examination - - - - - 200

Higher Examination (except Pure Mathematics) - 350

Half the above number of marks will be obtainable in the case of the Practical Examinations.

250 marks will be obtainable on each of the two papers constituting the Higher Examination in Pure Mathematics.

150 marks will be obtainable in Freehand Drawing.

10. Before considering what awards should be made, the marks in each subject will be diminished in the Lower Examination and in Freehand Drawing by 40 per cent., and in the Higher Examination by 30 per cent. of the maximum allotted in each case.

11. Each successful candidate for a SCHOLARSHIP will be required to submit, for the approval of the Board, a scheme showing precisely how he will spend his time during his tenure of the Scholarship; and it must be clearly understood that this tenure is subject to the condition that the holder pursues such a course of work or study as has been approved, or required, by the Board. The course should be theoretical and practical, so as to improve both his mental and manual training. The holder of a Scholarship will be required to devote his time,

whilst holding the Scholarship, entirely to the prosecution of his education as a mechanical engineer. The Scholar may be required to attend in person, on a date specified, at the Offices of the Board, in order to submit his scheme of work. In such cases he will receive a subsistence allowance of 7*s.* 6*d.* for each night he is required to be absent from home, and third-class railway fare; but no cab or omnibus fares are allowed.

12. On the final award of each Scholarship the first half-yearly payment of the Scholarship money will be made. The further payments will be made half-yearly on the receipt, on the 1st May and 1st November of each year, (*a*) of a satisfactory report to be submitted by the scholar, showing that he has followed out the approved course, and (*b*) of satisfactory evidence of progress, diligence, and regular attendance to be submitted both by the Authorities of the Institution at which the scholar has been pursuing his theoretical studies, and by some person in authority in the firm or shops where he has been employed. The Scholarship may be withdrawn if the Board are not satisfied with these reports. The Board may at their discretion vary the number and time of payment of the instalments of the Scholarships.

13. No scholar will be permitted to take any place of profit, or continue in any business he may be engaged in when he obtains his Scholarship, save under very exceptional circumstances and with the special sanction of the Board. He must devote himself to completing his education at the place or places of study or work approved by the Board.

14. The Scholarships are not tenable with the Royal Scholarships and Free Studentships of the Board of Education, nor with Admiralty Studentships and Scholarships of the Royal Naval College. The holders of such Royal Scholarships or Free Studentships are, however, not debarred from competing for the Whitworth Scholarships, and holding them if they resign the other assistance. No candidate can obtain a Whitworth Scholarship twice, and no Whitworth scholar is eligible to compete for a Whitworth Exhibition. Those scholars who follow out their approved Courses to the satisfaction of the Board will receive a Certificate, and any who have not previously held Whitworth Exhibitions will also receive a Bronze Medal. Scholars who have previously received Medals as Exhibitioners will not be entitled to a further Medal.

15. Each successful candidate for an Exhibition will be required to submit for the approval of the Board a scheme of work or study for the year of holding his Exhibition. Considerable latitude will be permitted to him in framing this scheme, which should be theoretical and practical so as to improve both his mental and manual training. On the approval of this scheme half of his Exhibition money will be paid. The other half will be paid on the receipt, at the end of the Exhibition year, which terminates on the 1st May, (*a*) of a satisfactory

report to be submitted by the Exhibitioner, showing that he has followed out the approved course, and (*b*) of satisfactory evidence of progress, diligence, and regular attendance to be submitted both by the Authorities of the Institution at which the Exhibitioner has been pursuing his theoretical studies, and by some person in authority in the firm or shops where he has been employed. The Exhibitioner must also submit to the Board any laboratory note-books which have been used during the year. The Board may withhold the second moiety of the Exhibition if they are not satisfied with the reports and note-books referred to above. Exhibitioners will be permitted to hold posts of profit or emolument while holding their Exhibitions. Those Exhibitioners who follow out their approved Courses to the satisfaction of the Board will receive a Certificate and Bronze Medal.

16. The Exhibitions are tenable with the Royal Scholarships and Free Studentships of the Board of Education, but not with Admiralty Studentships and Scholarships of the Royal Naval College. No person may hold a Whitworth Exhibition twice; an Exhibitioner may, however, if otherwise eligible, compete for a Scholarship in a subsequent year.

17.—(*a*) Intending candidates must make their applications for admission to the competition on the prescribed form (copies of which can be obtained from the Board) not later than **1st January 1914.** The application must indicate the subjects and stages in which the candidate desires to be examined for the purposes of the competition, and must be accompanied by a certificate of British nationality upon a separate form prescribed for the purpose. Credit will not be given for marks obtained in examinations other than those entered on the form of application. A certified statement of the candidate's workshop qualifications under Article 2 (*c*) must be forwarded on the prescribed form not later than the **15th May 1914.**

(*b*) The Board will require candidates who are successful in the competition to submit a medical certificate and a birth certificate.

18. Candidates must make their own arrangements for admission to the Competitive Examinations to be held from the 9th to the 28th May. The Board will announce to the candidates concerned the arrangements which have been made for the examination in Freehand Drawing to be held on the 2nd March. The Time Table of the Examinations is printed on page 7.

NOTE.—The syllabuses of the subjects of competition may be obtained from Messrs. Wyman and Sons, Ltd., Fetter Lane, London, E.C.; or H.M. Stationery Office (Scottish Branch), 23, Forth Street, Edinburgh; or Messrs. E. Ponsonby, Ltd., 116, Grafton Street, Dublin.

Time Table of Competitive Examinations

FOR

Whitworth Scholarships and Exhibitions, 1914.

Date.	Day of the Week.	Time.	Subject.
2nd March	Monday -	7—9.30 p.m.	Freehand Drawing.
9th May -	Saturday -	2—10 p.m.	Practical Metallurgy (Higher Examination).
		5—10 p.m.	Practical Metallurgy (Lower Examination).
11th „ -	Monday -	7—10 p.m.	Sound and Light.
12th „ -	Tuesday -	2.30—10.30 p.m.	Practical Inorganic Chemistry (Higher Examination).
		5.15—10.30 p.m.	Practical Inorganic Chemistry (Lower Examination).
13th „ -	Wednesday	7—10 p.m.	Theoretical Mechanics (Fluids).
14th „ -	Thursday -	7—10 p.m.	Theoretical Mechanics (Solids).
15th „ -	Friday -	7—10 p.m.	Pure Mathematics, Higher —Paper I.
16th „ -	Saturday -	6—10 p.m.	Practical Geometry and Graphics.
18th „ -	Monday -	7—10 p.m.	Pure Mathematics, Lower, and Higher—Paper II.
19th „ -	Tuesday -	7—10 p.m.	Magnetism and Electricity.
20th „ -	Wednesday	7—10 p.m.	Heat.
21st „ -	Thursday -	7—10 p.m.	Theoretical Metallurgy.
22nd „ -	Friday -	7—10 p.m.	Theoretical Inorganic Chemistry.
23rd „ -	Saturday -	6—10 p.m.	Building Construction. Naval Architecture. Machine Construction and Drawing.
25th „ -	Monday -	7—10 p.m.	Practical Mathematics.
26th „ -	Tuesday -	7—10 p.m.	Applied Mechanics (Materials and Structures).
27th „ -	Wednesday	7—10 p.m.	Applied Mechanics (Machines and Hydraulics).
28th „ -	Thursday -	7—10 p.m.	Heat Engines.

FOR OFFICIAL USE.

BOARD OF EDUCATION.

PROSPECTUS

OF THE

ROYAL COLLEGE OF ART

LONDON.

(For Session 1913—1914.)

LONDON:
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PROSPECTUS

OF THE

ROYAL COLLEGE OF ART, LONDON.

Objects of College.

1. The Royal College of Art is maintained for the purpose of training Art Masters and Mistresses for the United Kingdom, and for the instruction of students in Drawing, Painting, Modelling, and Designing, for Architecture, Manufactures, and Decoration. Whilst the Royal College of Art is primarily intended for the instruction of teachers and students selected by competition in the Art Examinations of the Board of Education, other students are admitted so far as there may be accommodation for them, on the payment of fees.

Associateship.

2. The Full Associateship is granted to students who have qualified in the four Schools of the College. *See* § 11.

The Schools Associateship is granted to students who have qualified in whatever School of the College is selected by them. *See* § 12.

Certificates of Merit may be awarded to students. *See* § 41.

Course of Instruction.

3. The instruction in the College is arranged with a view to students passing through a course of instruction either in all the four Schools, viz.: Architecture; Ornament and Design; Decorative Painting; Sculpture and Modelling; or in one or more of the Schools only (*see* syllabuses of courses of instruction, page 17 *et seq.*). Instruction is also given in a Supplementary School of Etching and Engraving and in Craft Classes.

Organisation of College.

4. Each School of the College is divided into an Upper and a Lower Division, and candidates upon their admission to the College are placed in one or other according to their proficiency. The students come under two categories:—

(*a*) Those who are passing through the course for the training of Teachers, with a view to obtaining the Full Associateship.

(*b*) Those who are specialising in one or other of the four Schools of the College, with a view to obtaining the Schools Associateship. *See* note below.

The courses are arranged for the holders of National Scholarships, Royal Exhibitions and Free Studentships, the regulations affecting whom are given at page 13 *et seq.* Other students will be required to follow one or other of the above courses.

There is no age limit for candidates desiring to enter the College.

CONDITIONS OF ADMISSION AND FEES.

Admission.

5.—(*a*) Holders of Royal Exhibitions, National Scholarships, and Free Studentships are admitted to the College without being required to pass the entrance tests or to submit works (§§ 9 and 10 below).

(*b*) Holders of Local Exhibitions are required to pass the entrance tests but not to submit works.

(*c*) All other candidates for admission to the courses specified in §§ 3 and 4 must fulfil the requirements of §§ 9 and 10.

*Fees.**

6. The fee for either of the courses specified in §§ 3 and 4 is £12 10*s.* per term. For external students not following either of these courses the fee for the School of Etching and Engraving is £3 3*s.* and for each Craft Class (§ 15) attended £2 2*s.* per term. When students join at half-term, half the full fee is charged. All fees must be paid in advance to the Registrar of the College.

Free Admission.

7.—(*a*) Exemption from fees is granted to holders of Royal Exhibitions, National Scholarships, Free Studentships and Local Exhibitions.

(*b*) Exemption from fees may be granted by the Board to other students following one or other of the courses of the College, if specially recommended for such exemption by the Principal.

(*c*) The period for which exemption from fees may be continued will in each case depend upon the conduct and progress of the student, which must be satisfactory to the Board. In no case can such exemption be continued for more than five years.

NOTE.—All students must pass satisfactorily through the Introductory Course of Architecture before specialising in any other School; but those who show that they have a general knowledge of Architecture, within the limits of the Introductory Course given on page 17 of the Prospectus, may pass directly to the School in which they desire to specialise.

* Cheques and Postal Orders should be made payable to the Board of Education or Order, and should be crossed "Account of H.M. Paymaster-General."

8. The number of fee-paying students may not exceed 150 at any one time ; and the total number of free and fee-paying students per Term in the College is limited to 350.

ENTRANCE TESTS AND EXAMINATIONS FOR FULL ASSOCIATESHIP COURSE.

9.—(*a*) Candidates not exempted from this requirement (*see* § 5) who desire to enter for the course of instruction for the Full Associateship, must submit, a fortnight before the end of a term, or half term, or in the case of candidates wishing to enter the College in October who are unable to submit the works earlier, three weeks before the beginning of the session, a folio of drawings as mentioned below :—

Architecture.—A careful drawing of a building, or some portion of an ancient or modern building of artistic interest.

Sculpture.—Two studies of heads carefully drawn from life with the point.

Painting.—A drawing in charcoal of an antique figure ; the broad masses of light and shade only to be indicated.

An anatomical drawing (bones and muscles) of the same figure.

Ornament and Design.—Three very careful drawings of flowers and foliage, one in pencil, one in water-colour, one in pen and ink, all from the same subject.

A sheet of lettering done from good Roman capitals. The selection of a good plain type is essential.

(*b*) Candidates who have had works accepted for the Art Class Teacher's or Art Master's Certificates, or who have obtained awards in the National Competition for work in subjects similar to those required, will not be called on to submit works in those subjects. Candidates wishing to take advantage of this privilege should submit with their applications a list of the successes they have obtained.

(*c*) If these drawings are accepted, candidates must take test examinations in the four subjects, of which they must pass in three. Such test examinations will be held at the commencement of each term and half term.

The following are the subjects for the test :—

Architecture.—A drawing of a small architectural object in the Victoria and Albert Museum selected for the purpose.

Time allowed : 12 hours.

Sculpture.—A model in clay of the mouth of Michael Angelo's David.

Time allowed : 6 hours.

Painting.—A drawing in charcoal from life of the head, hand, and foot, the light and shade being slightly indicated.

Time allowed: 9 hours.

Ornament and Design.—A drawing from memory of a piece of foliage such as that of the oak, ash or lime.

Lettering by hand of a given sentence, *or* a simple problem in designing, to fill a given space.

Time allowed: 9 hours.

(*d*) Candidates who have passed one of the Board's Art Examinations in 1913, or have obtained 1st class successes at Examinations prior to 1913, in subjects similar to those required, will not be called on to enter for examination in those subjects. Candidates wishing to take advantage of this privilege should submit with their applications a list of the successes they have obtained.

Candidates who have sat for Examination in 1913 and failed, may apply to have the work done by them at the Examination considered and a decision given as to whether they may be exempted from any part of the test.

ENTRANCE TESTS AND EXAMINATIONS FOR SCHOOLS ASSOCIATESHIP COURSE.

10. A candidate who desires to enter for the course of instruction for the Schools Associateship (*i.e.*, to specialise in one or other of the four Schools) must state the School to which he desires to be admitted. His application, with the required works, where exemption is not given from this requirement (*see* § 5), must be submitted a fortnight before the end of each term or half term, or in the case of candidates wishing to enter the College in October who are unable to submit the works earlier, three weeks before the beginning of the session.

For the School of Architecture.

(*a*) The works to be submitted by a candidate are:—

(1) A measured study in pencil, upon an imperial sheet, of some portion of an ancient building, to the scale of not less than $\frac{1}{2}$ inch to one foot; also a drawing of mouldings, full size, and of some ornament.

(2) A perspective sketch of the same subject.

(*b*) Candidates who have had works accepted for the Art Class Teacher's or Art Master's Certificates, or who have obtained awards in the National Competition for work in subjects similar to those required, will not be called on to submit works in those subjects. Candidates wishing to take advantage of this privilege should submit with their applications a list of the successes they have obtained.

(*c*) The examination or test of the candidate at the College consists of making a drawing, to be plotted on the spot, from measurement, and executed in six days, of some architectural object in the Victoria and Albert Museum selected for the purpose.

Time allowed: 6 days.

(*d*) Candidates who have passed one of the Board's Art Examinations in 1913, or have obtained 1st class successes at Examinations prior to 1913, in subjects similar to those required, will not be called on to enter for examination in those subjects. Candidates wishing to take advantage of this privilege should submit with their applications a list of the successes they have obtained.

Candidates who have sat for Examination in 1913 and failed, may apply to have the work done by them at the Examination considered and a decision given as to whether they may be exempted from any part of the test.

For the School of Ornament and Design.

(*a*) The works to be submitted by a candidate are:—

(1) Six drawings from nature or architecture, of which at least two must be very careful pencil drawings of flowers and foliage.

(2) A sheet of lettering done from good Roman capitals.

(*b*) Candidates who have had works accepted for the Art Class Teacher's or Art Master's Certificates, or who have obtained awards in the National Competition for work in subjects similar to those required, will not be called on to submit works in those subjects. Candidates wishing to take advantage of this privilege should submit with their applications a list of the successes they have obtained.

(*c*) The examination or test of the candidate at the College consists of:—

(1) Drawing from a cast in pencil.

(2) Lettering by hand of a given sentence.

(3) Drawing from memory some piece of common foliage such as that of the oak, ash, or lime.

(4) A simple problem in design.

Time allowed: 3 days.

(*d*) Candidates who have passed one of the Board's Art Examinations in 1913, or have obtained 1st class successes at Examinations prior to 1913, in subjects similar to those required, will not be called on to enter for examination in those subjects. Candidates wishing to take advantage of this privilege should submit with their applications a list of the successes they have obtained.

Candidates who have sat for Examination in 1913 and failed, may apply to have the work done by them at the Examination considered and a decision given as to whether they may be exempted from any part of the test.

For the School of Decorative Painting.

(*a*) The works to be submitted by a candidate are :—

(1) A drawing in charcoal of an antique figure, broad masses of shadow only to be indicated.

(2) An anatomical study in charcoal of the same figure (bones and muscles). The figure is to be about one-third life dimensions.

(3) A life-size drawing in charcoal from life of the head and arm, broad masses of shadow only to be indicated.

(*b*) Candidates who have had works accepted for the Art Class Teacher's or Art Master's Certificates, or who have obtained awards in the National Competition for work in subjects similar to those required, will not be called on to submit works in those subjects. Candidates wishing to take advantage of this privilege should submit with their applications a list of the successes they have obtained.

(*c*) The examination or test of the candidate at the College consists of :—

(1) A drawing of a figure from the nude about one-third life dimensions.

(2) A drawing in charcoal of a head from life.

Time for each of these drawings, 6 hours.

(*d*) Candidates who have passed one of the Board's Art Examinations in 1913, or have obtained 1st class successes at Examinations prior to 1913, in subjects similar to those required, will not be called on to enter for examination in those subjects. Candidates wishing to take advantage of this privilege should submit with their applications a list of the successes they have obtained.

Candidates who have sat for Examination in 1913 and failed, may apply to have the work done by them at the Examination considered and a decision given as to whether they may be exempted from any part of the test.

For the School of Sculpture and Modelling.

(*a*) The works to be submitted by a candidate are :—

(1) A drawing from the antique.

(2) A drawing from life.

(3) An anatomical rendering in pencil (bones and muscles) of No. (2).

The above figures to be about one-third life dimensions.

(*b*) Candidates who have had works accepted for the Art Class Teacher's or Art Master's Certificates, or who have obtained awards in the National Competition for work in subjects similar to those required, will not be called on to submit works in those subjects. Candidates wishing to take advantage of this privilege should submit with their applications a list of the successes they have obtained.

(*c*) The examination or test of the candidate at the College consists of:—

Modelling a bust from the antique.
Time allowed, 6 days.

(*d*) Candidates who have passed one of the Board's Art Examinations in 1913, or have obtained 1st class successes at Examinations prior to 1913, in subjects similar to those required, will not be called on to enter for examination in those subjects. Candidates wishing to take advantage of this privilege should submit with their applications a list of the successes they have obtained.

Candidates who have sat for Examination in 1913 and failed, may apply to have the work done by them at the Examination considered and a decision given as to whether they may be exempted from any part of the test.

CONDITIONS OF GRANT OF FULL ASSOCIATESHIP.

11.—(*a*) In order to be entitled to the Full Associateship of the College students must:—

(1) have studied in the College for at least six terms; have spent at least one term in each School of the College and have been not less than four terms in the Upper Division of one or more Schools of the College;

(2) have obtained a First Class Certificate in the Upper Division of one of the Schools of the College, and either a First Class Certificate in the Lower Division or a Second Class Certificate in the Upper Division of each of the other three Schools;

(3) have executed a composition for a given decorative subject to the satisfaction of the Visitors.

(*b*) The Full Associateship will also be granted to those students who have passed satisfactorily through at least two years' training in the College (or National Art Training School) before October, 1900; have obtained the Art Master's Certificate, Group I.; and Certificates for two other groups.

CONDITIONS OF GRANT OF SCHOOLS ASSOCIATESHIP.

12. In order to be entitled to the Schools Associateship of the College students must :—

(1) have been at least four terms in the College; have spent one term in the School of Architecture, unless previously qualified in that subject (*see* note to § 4(*b*), page 5), and have been at least three terms in the Upper Division of the School in which they have specialised;

(2) have obtained a Certificate (or exemption) in Architecture, and a First Class Certificate in the Upper Division of the School in which they have specialised;

(3) have executed a composition for a given decorative subject to the satisfaction of the Visitors.

PRIVILEGES OF ASSOCIATES.

13.—(*a*) Students gaining the Full Associateship of the College are entitled to wear a hood and gown, and to use after their names the letters A.R.C.A. (London).

(*b*) Students gaining the Schools Associateship are entitled to wear a hood and gown, and to use after their names the letters A.R.C.A. (London), with the title of the School or Schools in which they have specialised, *e.g.*, A.R.C.A. (London) (Architecture).

14. Applications for the Diploma of Associateship should be addressed to the Registrar, Royal College of Art, South Kensington, London, S.W.

SCHOOL OF ETCHING AND ENGRAVING AND CRAFT CLASSES.

15. Students of the Upper Division of a School will be selected for instruction in one or more of the following subjects or of such others as may, from time to time, be included in the work of the College :—Etching and Engraving, Stained Glass, Tile Painting and Pottery, Writing and Illuminating, Tapestry Weaving and Embroidery, Stone and Marble Carving, Furniture Decoration, Wood Carving and Gesso Work, Metal Work and Enamelling.

The primary object of the Craft Classes is to afford students an opportunity of becoming practically acquainted with the capabilities and limitations of the materials in which their designs would be carried out. Before entering any of these classes students must first obtain the permission of the Principal, and they must either be students in the related School of the College, or have already passed through that School.

16. The times when the Classes meet are posted in the College.

17. A limited number of persons other than students following the regular courses of instruction in the College may be admitted to these classes. Such special admission to single classes will be granted only to applicants recommended by the Principal as fully qualified for the class work and will be limited by the conditions under which the several classes are conducted. No external students can be admitted to the Metal Work and Enamelling class.

STUDIES IN THE VICTORIA AND ALBERT MUSEUM.

18. Groups of students will study at appointed times in the Victoria and Albert Museum, under the guidance of the Instructor of the Division in which they are working.

TIMES OF STUDY AND VACATIONS.

19. The annual session consists of two terms :

The first term begins on Wednesday, October 1st, 1913, and ends on Tuesday, February 17th, 1914.

The second term begins on Wednesday, February 18th, 1914, and ends on Friday, July 3rd, 1914.

The Christmas holidays begin on Thursday, December 18th, 1913, and end on Monday, January 5th, 1914, both days included.

The Easter holidays begin on Wednesday, April 8th, 1914, and end on Wednesday, April 22nd, 1914, both days included.

20. The ordinary class hours are from 9.30 a.m. to 3.30 p.m. with an interval of one hour for lunch, and from 4 p.m. to 6 p.m.

21. Students are required to follow the courses of study laid down for them, and to attend the classes regularly.

22. A register of students' attendance is kept by the Registrar, and may be consulted by parents and guardians at his office. For further information application should be made to the Registrar, Royal College of Art, South Kensington, London, S.W.

Female students can obtain Board and Residence at Alexandra House. For terms apply :— The Secretary, Alexandra House, Kensington Gore, London, S.W.

COLLEGE EXAMINATIONS.

23. The work of the students is reviewed during each term, and the award of travelling scholarships and prizes is made at the end of each session by the Visitors on the work of the session. For all purposes the students' work will be judged by its general quality throughout the session.

AWARDS.

24. The following awards are tenable at the College during the session 1913–14:—

(*a*) Royal Exhibitions;
(*b*) National Scholarships;
(*c*) Free Studentships;
(*d*) Local Exhibitions.

25. Each Exhibition, Scholarship, and Studentship will be held on the condition that the holder's conduct and progress are satisfactory, and that he attends the approved course of instruction regularly, complies with all the rules, and passes the prescribed examinations.

26. A Royal Exhibition entitles the holder to an allowance of £60 a year for three years, and free admission to the lectures and instruction in the College approved for the Exhibitioner. As a student of the College, a Royal Exhibitioner may become eligible for the award of a Royal College of Art Scholarship.

27. A National Scholarship entitles the holder to an allowance of £60 a year for three years, and free admission to lectures and one or more of the Craft Classes, and instruction in one of the Schools of the College, with such other supplementary instruction as may be approved for the Scholar. As a student of the College, a National Scholar may become eligible for the award of a Royal College of Art Scholarship.

28. A Free Studentship entitles the holder to free admission for two years to the lectures and instruction in one of the Schools of the College, with such other supplementary instruction as may be approved for the Student.

The Free Studentship may be renewed exceptionally for one or two years.

29. Local Exhibitions, to which the Local Education Authority or Managers contribute not less than £25, and the Board not more than £25, are tenable at the Royal College of Art, subject to the conditions of § 5 (*b*) above. The fees for instruction are remitted to Local Exhibitioners.

30. The holder of a Royal Exhibition or National Scholarship is allowed third-class railway fare between his home and London for one journey to and fro each session. Third-class railway fare is allowed by the Board for one journey to London to a Free Student upon taking up his Free Studentship.

31. Royal Exhibitioners and National Scholars may be required to assist in teaching in the College.

32. Information as to the conditions of award of these Scholarships, Exhibitions, and Studentships will be found in the Board's Interim Regulations for Scholarships, Exhibitions, etc., for 1913. A revised Scheme for awards may be brought into force in 1914 or later.

REWARDS TO STUDENTS OF THE COLLEGE.

Scholarships.

Royal College of Art Scholarships.

33. A limited number of Royal College of Art Scholarships at the rate of £60 a year with free admission to the classes of the College, may be awarded, subject to the following conditions. These Scholarships will be tenable for a term, but may be renewed for further terms. No renewal can be made to a student beyond the term in which he completes a period of five years' free tuition at the College. A Royal College of Art Scholar may be required to assist in the teaching at the College. A Royal College of Art Scholar is given, by the Board, third-class railway fare between his home and London for one journey to and fro each session. Subject to the sanction of the Board of Education, these awards may be held concurrently with Scholarships or other aid granted by Local Education Authorities.

Students gaining Royal College of Art Scholarships cannot hold them concurrently with any other of the Board's Scholarships.

Students applying for these Scholarships must undertake to hold them throughout the term for which they are awarded.

Student Demonstratorships.

34. Two Student Demonstratorships of the value of 30*s.* a week may be awarded to Students who have taken the Full Associateship of the College and are in their fourth or fifth year. These Student Demonstratorships will carry free admission to the classes of the College and will be tenable in the first instance for not more than one term, but may be renewed for a second term. Students holding these Demonstratorships will be given by the Board third-class railway fare between their homes and London for one journey to and fro each Session. The holders for these awards will not be allowed to hold them concurrently with any of the Board's Scholarships or with Local Exhibitions, and will be required to devote about half their time to the performance of such teaching duties in the College as the Principal may from time to time arrange.

Students undertaking work outside College.

35. In their last term of attendance at the College, students in receipt of maintenance allowances, who are specialising in one or two of the Schools of the College, may be allowed to do their own work in the afternoons either in the College or outside and to take advantage of opportunities of establishing relations with manufacturers and others engaged in practical work. Application for permission to take advantage of this provision must be made in writing to the Registrar.

Travelling Scholarships.

36. A Travelling Scholarship of £65 may be awarded annually, on the recommendation of the Visitors, in the Upper Division of each School, to the best student who has been at least four terms in the College, has spent one term in the School of Architecture, unless previously qualified in that subject (*see* note to §4 (*b*), page 5) and has been at least three terms in the Upper Division of one or more Schools.

Holders of Travelling Scholarships will be required, as a rule, to travel during the whole of the second term of the session following that in which the award was made. In exceptional cases the Board may sanction a variation of this arrangement, if special application is made to them through the Principal at the beginning of the session following the award.

The payment of the Scholarship will be made by instalments, and the payment of any instalment may be dependent upon the production of satisfactory evidence that the Student has done good work while travelling for the purposes of the Scholarship.

The term during which the student is abroad will not count as a portion of the time during which he is entitled to hold a Scholarship or other corresponding privilege in the College.

A student cannot hold a Travelling Scholarship more than once.

Prizes.

37. Prizes may be awarded at the end of the Session to individual Students on the recommendation of the Visitors. The number and value of the prizes to be awarded in 1914 will be fixed subsequently.

Certificates of Merit.

38. Certificates of Merit (first and second class) may be awarded to students in the Upper or Lower Divisions on the recommendation of the Visitors and Staff of the College.

REGULATIONS TO BE OBSERVED BY STUDENTS.

39.—(1) All students must enter daily the times of their arrival and departure; books for this purpose are kept in the hall.

(2) Students are allowed from 12.30 to 1.30 p.m. for lunch, and no student may absent himself for a longer time or during College hours, without permission. Leave of absence for more than a day must be obtained in writing. Applications should be addressed to the Registrar.

(3) In case of absence from any cause a communication must be sent at once to the Registrar. When absence on account of illness exceeds two days, a medical certificate is required,

which must be sent to the Registrar, Royal College of Art, South Kensington, London, S.W.

(4) After absence, from illness or other cause, students must, on their return to the College, report themselves to the Registrar.

(5) Students who have been directed to work in the Victoria and Albert Museum or other places will be given a written authority which must be left with the Attendant at the entrance of the College, and students are required to have their College Ticket with them to show in the Museum on demand.

(6) No student is allowed to remain in the College after working hours.

(7) All applications for special leave must be made in writing to the Registrar.

(8) No student may hold any teaching post outside the College, or accept any occasional teaching work, or enter for any outside examination or competition, without first obtaining the consent of the Principal.

(9) No student may prepare or enter for any Examination, other than those forming part of his College course, or submit works for any Exhibition, without first obtaining the consent of the Principal.

(10) Any student who proposes to marry during his course at the College, must give notice of his intention in advance to the Principal.

(11) Each student must record his address, on the first day of term at latest, in the Register provided by the Registrar, and immediate notice of changes of address must be given to the Registrar in writing. The place of residence is subject to the approval of the College Authorities.

(12) Each student on registration will be handed a ticket of admission, which must be produced when required. If a ticket is lost, the Registrar should at once be informed in writing, when a Pass will be issued.

(13) The Board cannot be responsible for the custody of the private property of students, nor can any claim be entertained in respect of any articles that may be left in the College. Each student is provided with a locker for which a padlock and key may be supplied by the student.

(14) It is the duty of all students to read and comply with the Prospectus as annually revised and any official notices which may be posted in the College.

(15) Communications to the Royal College of Art should be addressed to

The Registrar,
Royal College of Art,
South Kensington,
London, S.W.

SYLLABUS

OF

THE COURSES OF INSTRUCTION

OF

THE ROYAL COLLEGE OF ART.

SESSION 1913-14.

ARCHITECTURAL COURSE.

Professor—A. BERESFORD PITE, F.R.I.B.A.

Assistant Instructor—A. E. MARTIN, A.R.C.A. (London).

The Architectural School consists of a Lower and of an Upper Division.

The Lower Division provides a general architectural course adapted for all students entering the College, unless previously qualified in the subject, and usually extends to one term only.

The Upper Division is divided into two sections:—

(1) the ordinary course which is adapted for general students who desire to continue the study of architectural design; and

(2) the advanced course which is undertaken by specialised students who propose to become teachers, architects, or workers in the building crafts.

Students intending to specialise in architecture, are advised to undertake the Lower Division course of study before entering upon the courses of the Upper Division.

The ordinary and advanced courses of the Upper Division are available for students who, having taken the Lower Division course on entering, afterwards specialised in one of the other schools of the College.

The following syllabus is varied in subjects and detail each year, but the courses and methods of study indicated are generally adhered to.

Advanced students in the Upper Division undertake special studies, other than those set forth in the Syllabus, as approved by the Professor.

Lower Division.

The course for the First Term includes the following syllabus of English Woodwork and Masonry, and of Greek and Italian Renaissance Architecture.

English Woodwork.

I. Measured drawings of objects in the Victoria and Albert Museum :—

(*a*) Small scale studies, forming a series illustrative of the historical development of framing and of the employment of mouldings and carved ornaments.

(*b*) Full size working drawing, suitable for a practical workman, of one example in the Museum.

II. Lectures with lantern photographic illustrations will be given on the historical development of woodwork ornament.

III. Series of studies from photographs and plates of ancient examples of internal treatment of rooms, &c.

IV. A subject in design based upon the foregoing studies will be given, *e.g.*, the panelling and fitting up of a portion of a modern building, with working and detailed drawings, full size mouldings and carving.

English Mediæval Masonry.

I. Course of lectures on English Mediæval Masonry, illustrated by lantern photographs, dealing with the development of ecclesiastical buildings from the Saxon till the Tudor period ; and especially with vaulting and the progress of craftsmanship as illustrated in mouldings and carving.

II. Series of geometrical sketches from published drawings of ancient examples.

III. Visits to examples of Mediæval Building in and near London, and to selected modern churches.

IV. Full size templates of pier mouldings including archivolts and vaulting ribs.

V. Subject in design based upon the foregoing studies for some portion of an ecclesiastical building including a vault. Drawn to one-half inch scale with the vaulting geometrically projected, and with the mouldings and springer full size.

Greek Architecture.

I. Course of lectures on the development of Greek Architecture in Asia and Europe, and on the buildings of the Acropolis at Athens, illustrated by lantern photographs and diagrams.

II. Small studies of the proportions of the Doric and Ionic orders, accompanied by full size sections of mouldings.

III. Visits to the British Museum and to buildings in London of the early nineteenth century in the Grecian style.

IV. Subject in design illustrating the picturesque effect of symmetrical treatment, *e.g.*, in columnar architecture in perspective.

Italian Renaissance.

I. Course of lectures on the work of the architects of Florence and Northern Italy in the fifteenth and sixteenth centuries, *i.e.*, from the completion of the Duomo at Florence to that of St. Peter's, Rome, with lantern photographs and diagrams.

II. Series of geometrical sketches from plans and photographs of the development of civil buildings.

III. Measured drawings and sketches from casts and objects in the Victoria and Albert Museum illustrating the development of Renaissance ornament and the employment of sculpture in conjunction with architectural forms.

IV. Subject in design based upon a phase of the Renaissance or upon the work of a master, involving the treatment of ornament for a monument, fountain, pulpit, &c.

V. Copy studies of selected examples of coloured decoration of the Early Renaissance.

Upper Division.

Ordinary Course.

This course consists of the detailed design of one or more subjects, with a series of precedents.

The subjects illustrate the combination of Architecture with Colour Decoration and Sculpture.

Careful measured Studies of Greek Marbles in the British Museum, and of other ancient examples are undertaken by students in this course as special subjects.

Visits are paid to buildings illustrative of the subjects of study, and outdoor sketching is undertaken on these occasions.

A syllabus of the principal subjects for design is prepared for each term; among these have been included:—

A Pavilion for an International Exhibition, with an open loggia decorated in colour.

The decoration of the Sanctuary of an Italian Renaissance Church.

A Club House for a country town, with ornamental plaster ceilings and panelled staircase.

A Town Mansion, with Hall, Staircase, and Drawing-room decorated in colour.
A public Square, with Fountain.

The detailed syllabus of one term's subject is set out below to illustrate the course of study.

Domed Architecture :—

I. Course of lectures on the progress of domed building from Roman to Byzantine, and to the Renaissance, illustrated with lantern photographs and diagrams.

II. Series of small scale studies, dated and noted, with part plan elevation and section of each, from drawings and photographs :—

(a) *Roman :—*

Pantheon, Rome.
Baths of Gallienus, Rome.

(b) *Byzantine :—*

St. Sophia, Constantinople.
St. Mark, Venice.

(c) *Renaissance :—*

Duomo, Florence.
St. Peter, Rome.
St. Paul, London.
Pantheon, Paris.

III. Subject for design involving the use of a dome, as a cemetery chapel in a campo santo, or a church in a tropical climate. The style to be some phase of Christian architecture, *e.g.*, Romanesque or Early Christian, comprising a decorative scheme in mosaic or fresco :—

(*a*) Working drawings to small scale and perspective sketch.
(*b*) Larger detail of a portion of the Chapel.
(*c*) Small scale scheme showing colour treatment in fresco or mosaic, without figures or ornamental details.
(*d*) Complementary to above: colour scheme, including figure compositions, &c.
(*e*) Ornamental details in colour.

Advanced Course.

As in the ordinary course of this Division, the subjects proposed to the advanced students include architectural design in combination with the allied arts of Decorative Painting and Sculpture, and in conjunction with the handicrafts of Ornamental Wood and Metal Work.

One subject is selected each session; the first term is devoted to preliminary designs and to the study of precedents, the architectural and technical aspects of the design being first considered; the second term's work is the study and design of the decorative portions of the subject, the preparation and completion of working and detail drawings that would be required for the due execution of the proposed work.

Among the subjects dealt with have been:—

A Town Church in the Renaissance manner decorated in colour.

A College Chapel in the English Mediæval manner with stallwork and vaulting fully detailed.

A Country Residence for a Prince as a subject in Domestic Architecture.

A Naval Monument for St. Paul's Cathedral.

The syllabus of the studies for the latter design is set out below to indicate the course of study in the subject of the combination of sculpture and architecture.

The outline syllabus for the study of Colour Decoration and Architecture, and the general syllabus of English Domestic Architecture are also added.

Sculpture and Architecture.

I. Series of historical studies made from casts and marbles in the Victoria and Albert and British Museums of the employment of sculpture in architecture: illustrating position and purpose of sculpture as well as character, with plans and elevations.

Greek.

(*a*) Pediment and Frieze, *e.g.*, figures enclosed by architecture. Parthenon and Theseum.

(*b*) Tomb steles. Low relief free figures. Tower of the Winds. Pergamos.

(*c*) Detached figures. Monuments. The Mausolus quadriga. Nike of Samothrace.

(*d*) Figures attached to architecture. Caryatids. Erechtheum.

(*e*) Decorated columns and pedestals, *e.g.*, Ephesus.

Romanesque and early Mediæval.

Studies in Victoria and Albert Museum and from photographs and drawings in the Library:—

(*a*) Portal, Cathedral Santiago di Compostella, from cast in the Victoria and Albert Museum.

(*b*) Portal, Moissac. Beaulieu.

(*c*) Caryatid Piers, St. Trophime, Arles.

(*d*) Friezes on lintels. St. Trophime, St. Giles, St. Marthe, Tarascon.

(*e*) Free use on elevations. Poitiers. St. Jouin de Marne.
(*f*) Employment in panels.
St. Amande de Boixe. Selles sur Cher. Dax.
St. Paul de Varax.

Mediæval.

From casts in the Victoria and Albert Museum :—

(*a*) Figure of Christ from the Portal of Amiens, and key diagram of position.
Three sets of figures from Auxerre, and key.
Group from St. Sebald's Church, Nuremberg, by Adam Kraft, and key sketch.

Studies from photographs and drawings :—

(*b*) Scheme of West Front, Wells Cathedral.
Interior South Transept, Westminster Abbey.
Angel Choir, Lincoln Cathedral.
(*c*) Distribution of sculpture and schemes.
Porches, Chartres Cathedral. Notre Dame, Paris, West Front. St. Pierre sous Vezelay. The Abbey, Vezelay.

Renaissance.

Series of studies from casts in the Victoria and Albert Museum, sketch elevations and plans.

Italian Pre-Renaissance.

School of Pisani.
Pisa ; Baptistery pulpit. Cathedral pulpit.
Milan ; shrine of St. Peter Martyr.

Cinque Cento.

(*a*) Ghiberti. Florence Baptistery, north and east gates.
(*b*) Donatello. Annunciation from S. Croce Florence.
(*c*) Mino da Fiesole and Sansovino.

Michael Angelo.

Studies of composition :—

(*a*) Sistine Chapel, frescoes, groups.
(*b*) Medici Tombs, Florence.
(*c*) Bronze panel.

II. Series of sketch designs in historic styles.
A mausoleum.
The entrance to a Campo Santo.

III. Design for a monumental tomb in St. Paul's Cathedral, commemorating a hero. Small scale sketches, working drawings, large scale details, perspectives or models, the arrangement of sculpture being fully designed.

English Domestic Architecture.

I. Course of lectures on the historical development of house planning in England.

II. Studies made from illustrations of examples:—

(*a*) Prior to Elizabethan.
(*b*) Elizabethan and Jacobean.
(*c*) The works of Inigo Jones and Wren, and until Chambers.
(*d*) The Victorian revivals.

Plans and sketch elevations with characteristic details.
Position of gardens, names of rooms. Notes as to date, locality, and materials.

III. Exercises in design in the manner of the first three periods mentioned above.

IV. Design for a modern residence with working drawings, and some portion fully detailed for wood or stonework.

V. Internal decoration of hall or drawing room in colour.

Colour Decoration of Architecture.

I. Series of studies copied from drawings in the Art Library, and sketches from models in the Museum: to illustrate rise of the Renaissance School.

II. Analytical notes of each example giving some particulars of architectural situation and treatment, and of the system of colour decoration and ornament.

III. Preparation of design for treatment in colour of a portion of a Renaissance monument or building, *e.g.*, The Sanctuary of Sta. Chiara, Florence: in the Victoria and Albert Museum.

IV. Large scale details of coloured ornament.

V. Employment of coloured materials constructively and for surface enrichment.

VI. Mediæval colour decoration, studies of decorated rere-doses and other objects in the Museum.

Students in the Advanced Course undertake special surveys of ancient monuments as complete records, and archæological restorations of Greek buildings.

Full size cartoons have been prepared of the order of the Mausoleum at Halicarnassos with a small scale restoration.
Diagram, one-eighth full size, of the order of the Parthenon.

Complete surveys of important buildings abroad are made by the travelling students of this school, and are worked out and completed in the College; among these have been:—

The Pazzi Chapel, Florence.
The decorated Church at Saronno near Milan.
The domed Church at Montepulciano.
The Massimi Palace at Rome.

Among English monuments that have been surveyed and drawn are:—

All Hallows Church, Lombard Street, with its fittings of metal, marble, and carved wood-work.
The Abbey of Christchurch, Hampshire.

Complete ground plan survey of Westminster Abbey to a large scale.

MODELLING AND SCULPTURE COURSE.

Professor—E. Lantéri.
Assistant Instructor—B. Clemens.

Lower Division Course.

First Year—First and Second Terms.

Features of the face. Hands, feet of casts from life. Bust from the antique.

Second Year—First and Second Terms.

Figure from the antique. Anatomy of this study. Study of casts from life—torso, arm, leg, &c. Studies of plants.

Ornamental adaptation of the study; and study of carved and modelled ornament in relation to its place in architecture.

Upper Division Course.

Third Year—First and Second Terms.

Bust from life. Figure from life.

Composition: figure and ornament in the round and to fill architectural spaces.

A subject will be given every three weeks, and students' work thereon criticised.

During the third year course the following lectures and demonstrations will be given on—

1. The bust from life.
   Armature. Building up of a bust in clay. Measurements. Division of forms in the face.
   Practical modelling demonstration.

2. The figure from life.

First Lecture — Armature. Pose of the figure. Chief lines. Contrast of lines. Contrast of surfaces. Scale of proportions. Measurements. First practical modelling demonstration.

Second Lecture.—Osteological construction of the figure. Influence of osteology on the superficial forms.

Second practical modelling demonstration.

Third Lecture. — Central points of radiation in Myology. Variety of character of forms. Spaces of rest between each mass. A few comparative proportions.

Third practical modelling demonstration.

Fourth Year—First Term.

Modelling from life, in the round and in relief. Modelling of folds. Arrangement of draperies in the round and in relief. Figure design and ornament. Sketch subject every three weeks. Marble carving (ornament). Comparative anatomy.

During the fourth year course the following lectures and demonstrations will be given :—

1. Relief. Relief is an interpretation of nature. Projections must vary according to their surroundings. How relief must be treated in a study. Superposition of surfaces in the contours. High relief. Half relief. Low relief.

Practical modelling demonstration.

2. Folds of drapery. Characteristic points of the fold. Direction of surfaces of folds.

Practical modelling demonstration.

3. Arrangement of drapery on cast or lay figure. Drapery must contribute to explain the movement of the figure. Chief line of drapery. Masses of folds. Points of radiation of folds. Points of rest between each mass.

Practical demonstration on the arrangement of drapery on casts.

Demonstrations will be given of an arrangement of drapery in high relief, modelled in clay ; or the same arrangement in *low relief ;* and of figure and ornamental design for architecture and art manufacture—Medallions, medals, plaques, etc., Marble carving (pointing).

Fifth Year—First and Second Terms.

Studies from life, *life size.* Studies of arrangements of draperies from life. Studies of animals. Figure and ornamental design, *full size.* Special subject given and criticised every six weeks. Carving in marble (figure). Enlargement of figure by

pointing. General studies of antique sculpture : figure, drapery and composition.

Practical modelling demonstration of arrangement of draperies from life.

Practical demonstration of enlargement of figure.

Occasional practical demonstrations will be given on *casting* :—

1. Waste mould.
2. Gelatine mould.
3. Piece mould.
4. Piece mould in clay.
5. Clay squeezed into piece mould.
6. Casting from life.

DESIGN AND CRAFTS COURSE.

Professor—W. R. Lethaby, F.S.A., F.R.I.B.A.

Assistant Instructor—E. W. Tristram, A.R.C.A. (Design).

In the school of Design and Crafts practical workmanship in different classes is taken concurrently with the general drawing work of the studio, and every advanced student of design will be expected to make himself proficient in the technique of one craft.

Craft classes are already established in Etching and Engraving, Stained Glass, Pottery, Writing and Illumination, Embroidery and Tapestry Weaving, Marble and Stone Carving, Furniture and Gesso Work, Metal Work, and Enamelling.

The course of study in the studio and the museums is given below, but it must be taken as suggesting the scope of study rather than as a plan to be followed in exact sequence.

Every student of design will be required to make a series of *careful* studies in the museums; these should as far as possible be uniform in size for ready reference.

All advanced students of Design will be expected to specialise their studies with a view to perfecting themselves in one branch of art and coming into touch with special forms of industry, and with that object they may be required to attend the demonstrations of the Craft Classes and to engage in practical work of a certain number of subjects. Such special knowledge will be equally valuable to the teacher and the designer.

The following subdivisions are suggested, but there may be some interchange of studies :—

I. Decoration, stained glass, mosaic, tapestry, etc., involving figure composition.

II. Cabinet work, house decoration, pattern painting, stencils.

III. Pottery and porcelain design, majolica, etc.

IV. (*a*) Printed stuffs, wall papers, etc.; (*b*) textiles, embroidery, lace, carpets, and damasks.
V. Gold and silversmiths' work, jewellery, enamelling, etc.
VI. Modelled and carved ornament, in stone, wood and plaster, gesso work and gilding.
VII. The book and its decoration, illustrations, borders, type, initials, title pages; illumination and lettering, wood engraving, photographic reproduction, lithography, etching; bookbinding, cloth covers.
VIII. Metal work in wrought and cast iron, lead, brass, etc.

Lower Division Course.

First Year.

An introductory course in design, based on the following syllabus, will be taken in the first year's work in the Designing School, and special attention will be given to the following subjects as preliminary to the full course.

Copying of fine examples of ornamental drawing and design. Drawing from casts of selected ornament in pencil and pen and with the brush. Drawing to a large scale on dark paper in chalk. Memory drawing of flowers, etc.

Brush work in symmetrical patterns, making the most of the characteristic strokes of the brush. The same, translating natural forms into free brush work and arranging them to fill given spaces.

Studies from Nature to be very carefully made from flowers foliage, butterflies, shells, wings and other common and natural objects, and from photographs. Structure to be specially observed and refinement of drawing aimed at.

Second Year.

Same work continued.

Brush work applied to pottery painting and similar forms of design.

Studies from Nature to include reference to botanical and natural history books, old herbals, etc.

Black and White copying of fine examples of illustration, and engraving, studies from flowers and other objects in pen and ink.

Conditions of Pattern Design. Repeats as in a frieze, or every way as in a wall paper; usual sizes of repeats in printed and woven stuffs.

Development of Pattern Design, spaces divided into strips and meshes; counter-changing of black and white spaces, powderings.

Lettering in pen and brush work copied from fine examples.

Study of old examples in museum, making careful drawings of objects selected by the Professor.

Designing: simple exercises.

Students may join the Craft Classes by special permission.

Upper Division Course.

Third Year.

Same work continued, but with more special application to one of the branches of Design. Students will join one of the Craft Classes.

Studies from Nature, birds and animals to be studied in Natural History Museum.

Life and costume.

Black and White, objects in the museums, draperies, etc., to be studied in pen and ink.

Mechanical Conditions of Design, materials and methods of production.

Development of Pattern Design, sprigs, scroll patterns, knot work and labyrinthine patterns, borders, crestings, etc., showing how these elements apply to different materials.

Lettering, etc., text writing, ornamental initials, and decorative pages, illumination, proper place of type on the page.

Study of old examples in the Museum, mainly illustrative of the special branch of Design selected by the student.

Literature of Art, work in library, history of selected branch of Art.

Original Design, subjects to be worked out in consultation with the Professor.

Fourth Year.

Same work continued.

Museum Studies, with special relation to aptitudes and limitations of given materials and the historic development of crafts.

Figure Composition for given situations and materials.

Heraldry: study of the principles of, and practice of a good type of heraldic drawing.

Lettering. Inscriptions in given materials, on scrolls, monograms, cyphers, etc.

Symbolism, etc.: introduction to, and other accessory material for design, badges, insignia, ships, flags, crowns, armour, the zodiac.

Original Designs.

Fifth Year.

Original designing and craftsmanship in Craft Classes.

As far as possible students of the fifth year will be afforded facilities for getting into touch with manufacturers.

MURAL AND DECORATIVE PAINTING COURSE.

Professor—Gerald E. Moira.

Instructor—E. C. Alston.

Assistant—G. R. Woolway, A.R.C.A. (London).

In the School of Mural and Decorative Painting, composition of a decorative character is the principal feature of the course. Every student is required to follow the course except in instances where the work of a student justifies more rapid advancement.

Every composition is considered and executed with due regard to its fitness as an architectural decoration, and the scale of figures in relation to the space for which they are intended to decorate is made a particular feature of this work.

In such compositions, each student is required to select and pose his model, and also all arrangements of drapery, thus equipping the student to carry out any decorative work in after life, and also to give a sound training in the management of a school.

Studies from life are painted in the Upper Division in tempera, oil or paraffin wax, only at such times as the Professor may deem it necessary.

Lower Division Course.

First Year—First Term.

Antique School.—Five hour studies from the antique in charcoal for the purpose of training the student to see proportion, construction, and action. Studies to be not less than Imperial size.

Drawing of details from the life. Heads and hands: life size in charcoal or point.

First Year—Second Term.

Drawing from the antique in charcoal or point: Imperial size. Time allowed, three days.

Painting of a head from the antique in colour. Full size. Six days allowed.

Drawing of a head from the life in charcoal or point. Life size.

Second Year—First Term.

Painting of a figure from the antique in colour. Figure not to be less than 24 inches. Eight days allowed.

Painting of a head from the life in colour. Life size. Six days allowed.

Second Year—Second Term.

Painting of a head from the life in colour. Life size. Eight days allowed.

Figure composition: the elementary principles of design. Two or three days allowed.

Upper Division Course.

Third Year—First Term.

Figure composition: studies from life and drapery for same. These studies to be arranged by the student under the supervision of the Professor.

Third Year—Second Term.

Similar to first term, with a cartoon of the composition. This latter to be carried out full or half full size.

Fourth Year—First Term.

Drawing and painting from the life. The figure to be posed for eight days, from which a painting will be executed in oil or tempera.

The subject of the figure composition will be announced. Four days will be allowed for the composition, the dimensions of which will be given and its intended position stated; so that no composition will be executed without due regard being given to its fitness as an architectural decoration, and especially the scale of figures in relation to the spaces for which they are intended.

These compositions will be executed in charcoal, and the most successful will be carried out in colour with a medium selected by the Professor, which may be tempera, oil, or paraffin wax.

Studies in drapery to be executed in charcoal or colour, at the discretion of the Professor. Disposition of the folds to be arranged by the students under the direction of the Professor.

Fourth Year—Second Term.

The work of this term will be a continuation of the above, and according to the progress made by the students and their ability to cope with the composition of important subjects; so the time for this work will be extended.

Fifth Year—First and Second Terms.

Drawing and painting the figure. Students in this year will be required to undertake larger schemes of mural decoration, and with this end in view will be required to colour their cartoons, which may be their own designs, with a view to their execution in some definite material. The students may be required to assist in carrying out large schemes of decoration in the whole or part of a building, and must be prepared to work in various media.

At the 4 o'clock class meetings life studies from the nude will be executed in charcoal or point—time allowed, two hours.

ETCHING AND ENGRAVING SCHOOL COURSE.

Professor—Sir Frank Short, R.A., P.R.E.
Assistant—Miss Pott, R.E., A.R.C.A. (London).

Students in this class are required to work practically at one or more of the following methods of engraving, viz. :—

Etching.
Aquatint engraving.
Line engraving.
Mezzotint engraving.
Steel-facing and plate printing.

Tools and materials are provided.

COURSE ON METHODS OF TEACHING.

The Principal and Head Master—A. Spencer, A.R.C.A. (London).

The instruction given in methods of teaching will relate to the art instruction recognised by the Board of Education as given in Schools of Art. The period of training in the methods of teaching will spread over the whole course of a student's college career, and is intended to fit the student, on leaving to become a teacher, to grapple with the various points that may arise in dealing generally with Art instruction as above described.

Students who enter the College with the intention of becoming teachers will be required to attend lectures given by the Principal.

The lectures will treat of the following subjects :—

I. The history of Drawing as a means of education : the work of Rousseau, Pestalozzi, Froebel.

II. The necessity for the Art Master making himself acquainted with the system upon which pupils have been taught before entering the School of Art—

(*a*) The methods pursued in the Elementary and Secondary Schools :

(*b*) The Drawing the child has done from 7 years of age to 12, and between the age of 12 and his entering the School of Art.

III. Review of the subjects taught in Schools of Art and examined by the Board:—

(*a*) Division of the teaching between lectures, class work, and individual instruction.

(*b*) The Life Class: not an end in itself; its relation to other branches of work.

(*c*) The limitations of paper work and the beginning of craft work.

(*d*) Craft Classes: their relation to the classes for design, the general work of the School, and to manufactures.

(*e*) The mistake of neglecting general education in the Art Student.

IV. An analysis of the system of instruction in the Royal College of Art.

V. School Management:—

(*a*) Furniture, fittings, &c.

(*b*) Arrangement of class rooms, casts, school museum, library, photographs, &c.

(*c*) The Head Master: his duties to his Committee, his staff and his students.

(*d*) Necessity for the staff continuing their studies, or practising some special branch of art.

(*e*) Schools of Art and their influence—

(*a*) on the locality generally;

(*b*) on manufactures and industry.

(*f*) The relations between Schools of Art, Technical Schools, and Art Classes.

VI. Foreign methods compared: Primary and Secondary Schools, and Schools of Art in France, Germany, and Austria-Hungary. The École des Beaux Arts and the École des Arts Décoratifs et d'Art Industriel, Paris, and their influence.

As part of their training, students who follow this Course will also give instruction in the College and elsewhere under the direction of the Principal. According to their various years they will be required to give demonstrations either on paper or on the blackboard; and, in order to prepare them for this work, the Principal will give instruction four times a week on Methods of Teaching.

Students attending this Course will visit the Zoological Gardens one evening a week during the summer months for the purpose of obtaining practice in the drawing of animals.

The Instructor responsible for the meetings from 4 to 6 o'clock will be assisted by the Senior Students in taking charge of the Life and Antique Classes, according to their years. The pose of the model, and the antique figures to be drawn, will be decided upon at a morning lesson, when the work also will be arranged for the 4 to 6 o'clock meetings of the following week. The student in charge will be required to give a demonstration before the class, and in presence of the Principal, of his method of commencing a figure and of carrying it through to the blocking in of the broad masses of shadow.

LITERARY COURSE.

Lecturer—Beckwith A. Spencer, M.A., F.S.A.

All students of the College are required to attend the lectures of the Literary Course, to write Essays on various subjects connected with the lectures, and to attend the French or Italian Classes, held by the Lecturer, unless they already show a competent knowledge of either of these languages.

Lectures are delivered on Crafts, with special reference to the collections in the Victoria and Albert Museum, and on Costume, Armour, &c. The general history of Art is dealt with in a four years' course of lectures, which is divided into the following periods:—

I.—(*a*) Pre-historic Art.
(*b*) The Art of Egypt, Chaldæa and Persia.
(*c*) Outlines of Greek History to 146 B.C.
(*d*) Greek Mythology. The Iliad, Odyssey, Hesiod.
(*e*) Greek Sculpture, Architecture, Vases, Coins, &c.

II.—(*a*) Outlines of Roman History to 476 A.D.
(*b*) Roman Architecture, Sculpture, and Painting.
(*c*) Early Christian Art.
(*d*) Outlines of Mediæval European History from the 5th to the 13th century.
(*e*) Byzantine Architecture.
(*f*) Mosaics.
(*g*) Mohammedan Architecture.
(*h*) Irish, Saxon, and German Illuminated MSS.
(*i*) Romanesque and Gothic Architecture.
(*j*) Romanesque and Gothic Sculpture.

III.—(*a*) The Renaissance in Italy.
(*b*) The Schools of Siena, Florence, Umbria, Venice, North Italy, and Rome.
(*c*) Architecture and Sculpture.
(*d*) Mural Decoration.
(*e*) Later Italian Painting and the Spanish School.

IV.—(*a*) The Renaissance in Germany, in France, and in Flanders.
(*b*) Art in the Netherlands in the 16th century.
(*c*) French Art in the 17th and 18th centuries.
(*d*) English Art up to the 17th century.
(*e*) England in the 18th century: Painting, Engraving, Furniture, Silver, &c.
(*f*) The Industrial Revolution of the 19th century and its effects.
(*g*) Modern problems and tendencies.

All students are required to attend the classes held by the Lecturer for the discussion of the subject matter of the lectures and for the revision of the students' notes.

Every student of the College is expected to execute a pictorial or decorative Figure Composition once a month as home-work; the subjects are selected from the literature of the period which is being studied in the lectures. The compositions will be hung in order of merit, and criticised by the Professor of Painting and Mural Decoration.

STAINED GLASS COURSE.

Teacher—Karl Parsons.

The students being already trained draughtsmen and painters, the teaching is mainly directed towards the acquirement of a knowledge of the craft, and especially of craft limitations as affecting design and execution.

The actual technique of painting and lead-working are therefore taught in the ordinary class lessons, and the direction and application of them in the special weekly lecture or demonstration.

In General.

The past history and place of Stained Glass in the Architectural Arts. The present conditions under which it is produced. Apprenticeship. Subdivision of labour. The possibilities of employment. The uniting of design and execution. Architectural fitness. Poetic and imaginative fitness.

In Detail.

Stained Glass essentially an art of the Middle Age. The Gothic revival—its effects—its defects—its present influence. The revival of craft—the master craftsman—his present position and opportunities—technical knowledge, perfection of each branch of it in modern work, but subdivided. The separation of design from execution—their reuniting in Art and Craft. Technical education.

Practical.

Glass—its nature and varieties—cutting and lead working. Working drawings and their preparation—tracing—painting—choice of glasses, colour, ornament. The importance of a special class of ornament limited by the craft as a right surrounding for figure work. Spacing, division of spaces. "Quarries," and their ornament. Diaper, "Canopy," or "Tabernacle" work. Reference to Architecture and to Nature. Suggestions from Nature and tradition—value of the latter—how to use it, and how far. Sketching for glass. Sketching to scale in glass itself. Cartoons. Composition. Imagination. Sacred History. Symbolism. Course of reading—list of books. Vestments and accessories—how to make them for studio use. Archæological correctness—its importance in church work.

POTTERY COURSE.

Teacher—R. Lunn.

The object of this class is to illustrate in a simple and inexpensive manner principles and facts relating to the making and decorating of Pottery—enabling students to design, make shapes, and decorate them, with a knowledge of the requirements for this important industry.

The following are some of the processes which will be taken :—

In the First Course.

Materials—Composition of body or paste. Clays and their contractions.

Making tiles—Plain, embossed, raised outline, and inlaid.

Plates, cups and saucers, bowls, etc., made by throwing on kick wheel, jigger and jolley.

Shapes turned in plaster of Paris upon the lathe, and moulded.

Mould making.

Ware made by pressing into moulds, and by casting with slip—Figure moulding and making.

Dip Ware— Slip painting.

Placing in biscuit kiln, and firing.

Second Course.

Decoration by painting with underglaze colours, and by filling in raised outlines with coloured glazes, by sgraffito, and by incising—ground laying.

Hardening—Glazing, and placing in glaze kiln.

Firing glazed ware.

Decoration by painting in overglaze, or enamel colours, and lustres.

Placing in enamel kiln, and firing.

Della-Robbia ware—Majolica.

Oriental tiles and shapes, showing their method of production.

WRITING AND ILLUMINATION COURSE.

Teacher—E. JOHNSTON.

a. The acquiring of a formal hand (founded on early writings).

This gives an insight into the construction of letters, and indicates how new forms may be designed, the pen being essentially a letter-making tool, and writing the medium by which nearly all forms of letters have been evolved.

b. The practical application of writing.

This inculcates right methods in the spacing, arrangement and combination of Letters and masses of Lettering, *e.g.*, in addresses, books, poems, and other MSS. and in "bill heads," book plates, "black and white work," title pages, "book decoration" and other printed matter: also in stone, metal and woodwork, and in handicrafts generally.

c. Theory of Lettering.

The principles underlying the construction and arrangement of good lettering, arrived at, analytically, by the study of old MSS. and inscriptions, and, synthetically, by the practice of writing.

Minuscule (small letters) and Majuscule (capitals) Roman, Uncial, Irish, Gothic and Italic forms.

Modification of forms to suit different processes and materials, *e.g.*, stone and metal engraving, wood-carving, pen versus brush work.

d. Gold-laying and burnishing in MSS.

Composition of "size": laying and burnishing gold leaf.

e. The Elements of Illumination.

"Rubricating" (*i.e.*, writing in red), writing and lettering in gold and colours, capitals and initials, decoration of initials, etc., borders and decoration of pages.

f. The qualities of good Writing are Readableness, Beauty and Character, and Illumination is the Decoration of such Writing. Writing and Illumination form the necessary foundation of good Typography and Book Decoration.

EMBROIDERY AND TAPESTRY-WEAVING COURSE.

Teacher—Mrs. ARCHIBALD H. CHRISTIE.

I. *Embroidery*—

Design. Materials. Study of historical examples in the Museum. Tracing on of patterns. Ancient and modern stitches and methods of work. Gold work. Figure work.

Applied work. Cut and drawn work, etc. Making up of finished work.

II. *Tapestry Weaving*—

Design. Study of historical examples. Materials. Warping the loom. Methods of work. Weaving small tapestries in silk, gold, and wool from the students' own designs.

MARBLE AND STONE CARVING COURSE.

Teacher—A. E. Smith.

These classes are formed for the purpose of enabling students the better to express their ideas in the materials for which they design in clay, thus giving them a knowledge of the limitations of these materials.

The course of study is divided into five terms, which correspond to the College terms.

First Term.—Practice in cutting marble and stone from ornament.

Second Term.—Finishing carving ornament.

Third Term.—Pointing with machine and carving a head in relief.

Fourth Term.—Pointing and carving a head in the round.

Fifth Term.—Enlargement with compasses and carving.

FURNITURE DECORATION, WOOD CARVING, AND GESSO WORK COURSE.

Demonstrator—G. Jack.

This class is conducted with a view to giving the students practical insight into methods of obtaining ornament in relief, such as carving in wood and work in gesso. It is intended that decorative colouring as applied to gesso work shall be taken up as soon as the studies in progress are sufficiently advanced.

In so far as it is possible the students are encouraged to develop their own individuality. Students make their own designs for the work they are to carry out, and these designs undergo the teacher's supervision and correction with a view to the practical necessities of the material.

1st. Gesso work.

2nd. Wood carving.

3rd. The inlaying of various coloured woods as applied to cabinet making.

4th. Decorative painting on wood in connection with furniture.

5th. Furniture designing with a view to combining the various kinds of decoration practised by this class.

METAL WORK AND ENAMELLING COURSE.

Teacher—H. STABLER.
Assistant Teacher—S. G. WISEMAN.

The instruction in this class is arranged with a view to affording students of the College an opportunity of becoming practically acquainted with the capabilities and limitations of the materials in which their designs, in this department of applied art, would be carried out.